THE HEATING AND VENTILATING MAGAZINE

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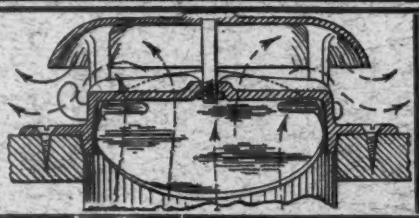

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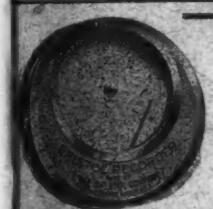

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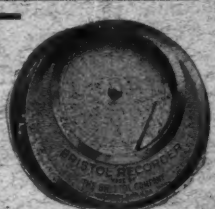

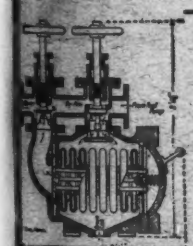

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THE HEATING AND VENTILATING MAGAZINE

1123 BROADWAY NEW YORK SEPTEMBER, 1912

Analysis of Central Station Steam Heating Rates

BY A. E. DURAM.

Recent investigations of the rates for heating charged by central station companies has disclosed a wide range both in rates and methods followed in giving service. As this item is easily the most important one in the operation of such a plant, the following points brought out by Mr. A. E. Duram, at the recent meeting of the National District Heating Association are especially timely and instructive. In connection with the accompanying abstracts of Mr. Duram's paper, we are enabled to present a chart especially prepared by him showing, at a glance, the variations in the rates in various cities:

Probably one of the most vital questions confronting the central station heating manager to-day is that of an adequate and at the same time an equitable basis of charge for the steam which is turned into his pipe line at the station and then left to work out its own salvation until it finally shows in the form of condensation at this or that consumer's meter, or is dissipated in line losses at some rate in inverse relation to the quality of the line and service insulation.

It is not the purpose of this paper to determine upon any specific rate of charge, but rather to suggest a method for such determination based upon the actual cost of the service rendered plus a fair percentage of profit, and to present a series of conditions which persist in affecting the promoting, financing and earning power of central station heating plants and especially the independent fuel burning plant.

It has often been said that heating rates will adjust themselves because with the domestic fuel condition in each locality and with each individual consumer's heating plant, this might possibly be true for like service, but as there is no comparison between the 24-hour service rendered by the central station and the average service obtained from the individual plant, this statement does not hold true.

It did not take long for the progressive station manager to recognize that the old flat rate per square foot was but a poor system of guessing and that every fair and economical consumer condensing from 500 to 600 lbs. per square foot was paying the dividends (if any were earned) for the man who was condensing from 1000 to 1200 lbs. per square foot per season.

With the knowledge of these conditions came the demand for and the production of a condensation meter that would measure the various

amounts of steam consumed and with these the change in rates to meet the new conditions.

At about this time the central station manager who had changed over to a meter basis and was getting 40 or 50 cents flat per 1000 lbs. for his steam was vainly trying to decide in his own mind whether he should take offense at the criticisms of his fellow managers or pride himself with the fact that he had taken a long step in advance and wait for his turn to laugh. He had not long to wait, as converts came rapidly and soon the desirability of a meter basis of charge became an established fact.

ADOPTION OF SLIDING SCALES.

This seemed for a time to fill every requirement for a just and adequate rate but as time went on it gradually became apparent through careful observation and comparisons of the various consumers' meter readings that there was a considerable variation in the demand and the steam consumption of the different classes of business being served and that with a flat charge per 1000 lbs. of steam which seemed adaquate to meet the general conditions it was difficult to interest the large consumer who was operating his own independent plant. To overcome this condition and for a better adjustment of rates on all classes of business various forms of cumulative and non-cumulative sliding scales have been adopted; some of these have met the conditions fairly well, while others are but little better than a flat charge of 1000 lbs. of steam.

In support of this statement and in order to show the great diversity of rates as they actually exist I beg to submit the rates of the various cities as follows:

Steam Heating Rates.

Pounds Steam Used in Any Month		DETROIT	Rates per 100 lbs in Cents
0	to	12,500	58
12,000	"	25,000	57
25,000	"	37,500	56
37,500	"	50,000	55
50,000	"	75,000	54
75,000	"	100,000	53
100,000	"	200,000	52
200,000	"	300,000	51
300,000	"	400,000	50
400,000		500,000	49
Above		500,000	48

10 per cent. on all bills paid on or before the 10th of month.

BALTIMORE.

2,000	to	25,000	90
25,000	"	40,000	85
40,000	"	55,000	80
55,000	"	70,000	75
70,000	"	85,000	70
85,000	"	125,000	65
125,000	"	250,000	60
250,000	"	500,000	55
500,000	"	1,000,000	50
1,000,000 and over			45

Above rates subject to 10 per cent. discount if payment of bills is made five days from date.

ST. PAUL.

30,000	to	60,000	85
60,000	"	90,000	80
90,000	"	120,000	75
120,000	"	150,000	70
150,000 and over			60

10 per cent. discount if paid on or before 10th day of month.

CLEVELAND.

First	10,000	1 00
2d and 3d	10,000	80
4th and 5th	10,000	70
6th and 7th	10,000	60
8th and 9th	10,000	45
Next	200,000	45
All over	290,000	40

DAYTON, O.; WAUKESHA, WIS.; MONMOUTH, ILL. ...

First	10,000	75
Next	10,000	70
Next	10,000	65
Next	20,000	60
Next	50,000	55
Next	200,000	50
All Over	300,000	45

10 per cent. if paid before the 10th of the month.

KANSAS CITY, MO.

First	50,000	65
Second	50,000	55
All Over	100,000	45

10 per cent. discount if paid on or before the 10th of the month.

SEDALIA, MO.

First	10,000	70
Next	10,000	65
Next	10,000	60
Next	20,000	55
Next	40,000	50

Next	250,000	45
Excess	340,000	40

10 per cent. discount for prompt payment..

ST. JOSEPH, MO.

First	10,000	1 00
First	10,000	75
Second	10,000	60
3d and 4th	10,000	50
50,000 to	100,000	45
100,000 and	over	40

5 per cent. discount for prompt payment.

YAKIMA, WASH.

First	10,000	1 00
Next	10,000	95
Next	10,000	90
Next	20,000	85
Next	50,000	80
Next	200,000	75
All over	300,000	75

10 per cent. discount if paid before the 10th of the month.

MILWAUKEE, WIS.

First	25,000	80
Second	25,000	70
Third	25,000	60
Next	75,000	50
All over	75,000	45

SEATTLE, WASH.

First	50,000	60
All in excess		50

No discount; minimum bill $3.00.

HARRISBURG, PA.

1,000		40

SIOUX CITY, IOWA.

First	10,000	90
Second	10,000	80
Third	10,000	70
Fourth	10,000	60
Thereafter		50

SPRINGFIELD, ILLS.

1,000		50

SPRINGFIELD, OHIO.

1,000		40

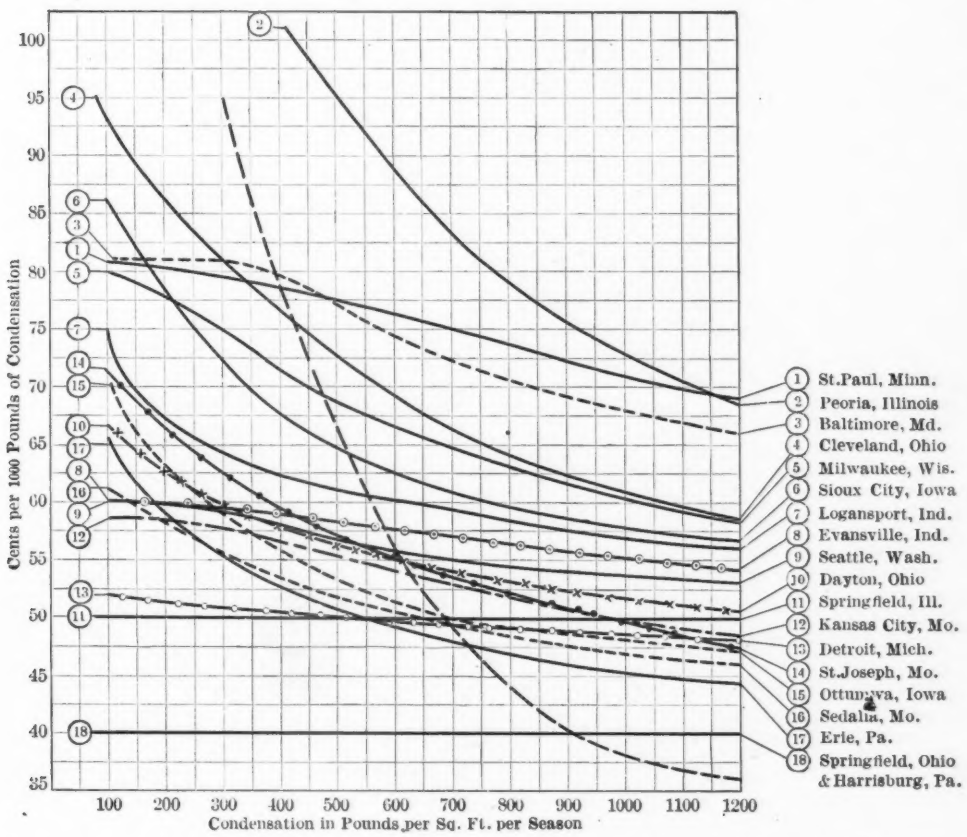


CHART I—RATE PER 1,000 LBS. OF CONDENSATION WITH VARYING ANNUAL CONSUMPTION, ACCORDING TO THE RATES IN EFFECT IN VARIOUS CITIES (BASED UPON 1,000 SQ. FT. OF RADIATION).

SPRINGFIELD, MO.

Same as Sedalia, Mo.

PEORIA, ILLS.

First	40,000	1.50
All excess		50

10 per cent. discount.

OTTUMWA, IOWA.

First	5,000	95
Next	5,000	75
Next	10,000	65
Next	10,000	60
4th & 5th	10,000	55
6th, 7th, 8th and 9th	10,000	50
Next	250,000	45

10 per cent. discount for prompt payment.

LOGANSPORT, IND.

First	50,000	65
Next	50,000	55
All over	100,000	50

No discount.

EVANSVILLE, IND.

First	50,000	60
Next	50,000	55
All over	100,000	50

10 per cent. discount if paid before 10th of month.

A careful study of these rates will present many interesting features and, by reference to curve sheet No. 1, rapid comparison may be made. These curves show the net rate per square foot per season for all rates of consumption from 100 to 1,200 lbs. per square foot and for comparison the writer might suggest the three Ohio cities as follows:

City.	Cents Per Square Foot Per Season. 300 Pounds Condensation Per Sq. Ft.	1,000 Pounds Condensation Per Sq. Ft.
Cleveland	81	61
Dayton	60	51.5
Springfield	40	40

It is almost certain that such radical differences do not exist in the cost of steam at the consumer's meter between three plants in the same State with similar coal and average temperature conditions.

Snap judgment of these comparisons would suggest that one of these rates is extremely high or another extremely low, but a careful analysis of the fixed charges, operating, distribution cost and general expenses, which are properly chargeable to each 1,000 lbs. of steam under varying conditions, would no doubt show a curve which would run diagonally through these rates from Springfield at 1,000 lbs. per square foot to Cleveland at 300 lbs. per square foot.

A TYPICAL RATE.

Now let us assume, merely for argument, the first of these cities, "Cleveland," which seems from the curve on No. 1 to have a rate as well proportioned as any on the sheet; and, by referring to the schedule, it will be recognized as one of the most advanced systems of rates in use to-day. An accumulative sliding scale, starting at $1.00 per 1,000 for the first 10,000 lbs., and ending at 40 cents per 1,000 for all over 290,000 lbs., is apparently an adequate rate, one which is high enough to protect the operating, distribution and fixed charges as against the small consumer and at the same time lowers to a point which we will assume makes it possible to get the large consumer.

But here let us ask a question; "Have we been correct in our interpretation of what constitutes a large consumer?" If we have, then there is nothing further to suggest; if not, then perhaps a revision of such an interpretation might suggest radically different ideas of what would constitute an equitable rate.

WHAT IS A LARGE CONSUMER?

For the purpose of this article the writer proposes to construe the large consumer as the one having the most desirable load for the central station, the one which consumes the greatest amount of steam with the smallest maximum demand upon the station.

Now let us assume that we have taken the entire amount of steam consumed in this particular city as shown by its meter readings and have divided this by the total number of square feet of radiation connected and that we have found an average condensation per square foot per season of 900 lbs. and, in a similar manner, a peak condensation of 1,600 lbs. Next, from the total charges against the heating plant for the year, and the total condensation we have found the average cost per 1,000 lbs. of steam

delivered to be 40 cents and in a similar manner from the total revenue we have found the average income to be 48 cents, or a net profit of 20 per cent.

Further we will assume Hocking Valley coal at $2.00 per ton delivered and an average evaporation of 7 lbs. of water per pound of coal which will give us an average cost of 14.3 cents per 1,000 lbs. of steam generated plus an approximate 10 per cent. for line and distribution losses or 15.7 cents net for coal. We will assume that water is being purchased at 5 cents per 1,000 gallons, which would add .6 cents or a total of 16.3 cents per 1,000 lbs. of steam delivered. Deducting this from the total cost of 40 cents we find a labor fixed charge and general expense cost of 23.7 cents per 1,000 lbs. of steam delivered.

We have already found the maximum or peak condensation to be 1,600 lbs. per square foot, consequently we must maintain power house and pipe line capacity; station labor and general expense sufficient to handle such a volume, yet we are only using on the average 9-16 or 56 per cent. of this capacity and we have 7-16 or 44 per cent lying idle and upon which we are forcing the 56 per cent. to pay the charges.

From the foregoing it is evident that within the limits of the station and the labor capacity that is being maintained, the only additional expense for an increase in the consumption per square foot would be for coal and water and a slight increase in the repair and renewal account. We have found the coal and water cost to be 16.3 cents and with 2 cents added for increased repairs, we have 16.5 cents as a new cost per 1,000 lbs. of steam delivered. If to this is added the same profit of 20 per cent., which we have previously used we have a new selling price of 19.8 or approximately 20 cents per 1,000 lbs. for all steam consumed per square foot connected which is in excess of the predetermined amount upon which the cost was based.

From the above costs we may calculate that for any excess consumption per square foot above the average and below the maximum we will have a fixed charge of 23.7 cents plus the variable charge for steam and water, and so, for a consumption of 1,200 lbs. per square foot we would have 23.7 plus 1.2x16.3, or 43.3 cents which equals 36 cents per 1,000 lbs., in the same manner we would find for 1,500 lbs., a cost of 32 cents per 1,000 pounds of steam delivered.

EFFECT OF SMALL CONSUMER.

So much for the large consumer, now to determine the effect cost of 40 cents per 1,000 lbs. is divided into two parts, a fixed charge and a variable, and that our fixed charge is based on an average condensation of 900 lbs. for each and every particular foot of conected radiation; consequently this fixed charge becomes an integral part of that one foot of radiation and must remain with it, it matters not whether its condensation rises to 1,500 lbs. per square foot or drops to 300 lbs., its proportion of the total cost must be paid and it should pay it.

From the above we may calculate that for a total condensation of 300 lbs. per square foot, we would have a fixed charge of 23.7 cents, plus a coal charge of 4.9 for 300 lbs. or 28.6 cents per square foot; this divided by 300 and multiplied by 1,000 gives us a cost of 95 cents per 1,000 lbs., and for 600 lbs. per square foot we have 23.7 plus a coal charge for 600 lbs. of 9.8 or 33.5 cents which is equal to 56 cents per 1,000 lbs. of steam delivered.

From the foregoing we have a cost curve runing from 95 cents at 300 lbs to 56 at 600, to 40 at 900, to 36 at 1,200 and to 32 cents at 1,500 lbs. per square foot.

This imaginary curve we have just drawn will be found dotted in on curve sheet No. 1 for comparison and while it does not represent correct values per 1,000 lbs. of condensation, it does represent the true characteristic of many central stations.

INCONSISTENCY OF CLEVELAND RATE.

Now let us assume two consumers on this station, one of 1,000 sq. ft., and one 2,000 sq. ft. of radiation con-

nected, and, for argument, that the 1,000 ft. consumer is averaging 1,200 lbs. per sq. ft. while the 2,000 ft. consumer is averaging 600 lbs. per sq. ft. The peak or maximum demand of one is double that of the other and, consequently, double the amount of investment and labor lying idle, yet, under the Cleveland schedule, they both pay the same price per 1,000 lbs. and the same monthly bill. Can this be correct? Not if the curve we have just worked out has any semblance of reason in its make up, for, according to it, the steam consumed in the smaller or 1,000 ft. job, averaging 1,200 lbs. per sq. ft. will cost us but 36 cents to generate and deliver, while that of the larger or 2,000 ft. job would cost 56 cents to generate and deliver.

With this difference in cost to deliver steam to each of these consumers it is evident that they should not pay the same price per 1,000 lbs., if they do, the small demand with the large consumption is paying the dividends for the large demand with the small consumption.

In order to eliminate such a condition as we have just assumed, the writer has to suggest a form of demand or readiness-to-serve rate in which each sq. ft. of radiation required protects its own fixed charge and in which all steam consumed in excess of the demand charge per sq. ft. is based on the minimum rate, both plus an equitable profit.

Let us assume that we have found for this station that it requires a demand charge of $1.00 for the first 50 lbs. per sq. ft. per month to care for fixed and capacity charges and that we have found for our variable that we must receive 25 cents per 1,000 lbs. for all excess steam consumed over the 50 lbs. per sq. ft. per month, then at this rate the 1,000 ft. customer with the 1,200 lb. average, would pay $80.37 per month and the 2,000 ft. consumer, with 600 lbs. average, would pay $117.87 per month, while, at the Cleveland rate, each would pay $98.68 per month.

COSTS IN INDEPENDENT FUEL-BURNING PLANT.

On curve sheet No. 2 are plotted the exact costs as taken from the estimates of the independent fuel-burning plant for a prominent Indiana city and from these a total cost curve showing the sum of the three cost curves at each ordinate. In comparison with this total cost curve, the writer has plotted two demand rates, one at $1.00 for the first 40 lbs. per sq. ft. per month and 25 cents for all excess, the other at 90 cents for the first 40 lbs. per sq. ft. per month and

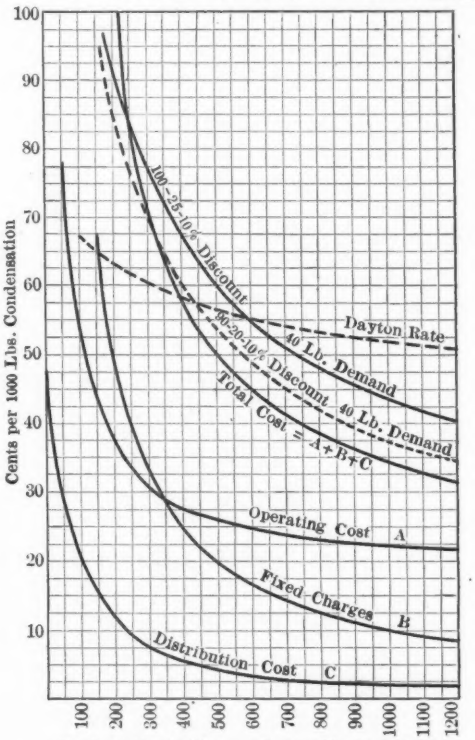


CHART 2—COST PER 1,000 LBS. TO DELIVER VARIOUS QUANTITIES OF STEAM PER SQUARE FOOT OF RADIATION PER SEASON, AS COMPARED WITH VARIOUS RATES OF INCOME.

20 cents for all excess, each with 10 per cent. discount for prompt payment. Both of these curves bear a theoretically correct ratio to the total cost curve, practically the only difference being in the percentage of profit and either would make an ideal rate curve for any station which follows the cost curves as shown . But no two stations do this, therefore such a total cost curve would have to be plotted

for each station and its rates adapted to it.

For the purpose of comparison the Dayton schedule, which is probably more generally used than any other, has been dotted in on this curve sheet. A mere glance will suffice to show that at least it is not adapted to this plant. These are typical curves only and do not represent the conditions of any other plant.

It is the opinion of the writer that but few managers have given the question of rates the time or consideration they require. This is a subject well worth your study and much good will come of it. Work out and plot your operating conditions; every manager should know these. When you have done this, plot in your rate and see how it fits: you may be able to materially benefit your earnings and your loading and these are the things that create salaries for managers.

HEATING RATES SHOULD NOT BE LOWERED.

The natural tendency of to-day is to lower the rates for heating, and this gradual reduction with its reaction, if it remains unchecked, will eventually demoralize the heating plant as a permanent undertaking. With new plants especially there is need for the co-operation of every member of this organization and every plant manager. If a prospective builder of a plant should visit your plant, boost the subject of rates, do not let him get away with an elaborate description of your mechanical conditions and the following memoranda relative to rates (2d year operation—100,000 sq. ft. connected—net income $20,000.00) because when he gets home and begins to sum up, one of the first things he discovers from this bit of information is that your average rate is only 20 cents per sq. ft. and his standard on the subject of an adequate rate immediately lowers.

If you have such a condition and ever hope to better it, you have a double reason to boost, because every comparison at a higher rate makes it easier to readjust yours. Next, and of still more importance, is the visit of an investigating committee from the council of the commercial association of some prospective city. A few wrong impressions left in the minds of such a committee makes it almost impossible to get a reasonable and adequate franchise.

Heating and Ventilating the Northwestern University Buildings

A COMBINED FORCED HOT WATER AND STEAM HEATING PLANT.

By J. M. Stannard.

The heating and ventilating of the Northwestern University buildings, at Evanston, Ill., are accomplished by hot-water forced circulation, and direct and indirect steam plants under both vacuum and gravity methods. The accompanying illustration shows the various buildings with the method of heating in each, the location of power plant and the size and location of feed mains.

The boiler plant consists of six boilers, four for the generation of steam and two for the reheating of the hot water. Two of the steam boilers are of the horizontal return tubular type, size 72 in. by 18 ft., each rated 150 H. P. and having grates 5 x 6 ft. The other two steam boilers are Sterling water-tube boilers, each rated at 250 H. P., and having grates 8 x 6 ft. The two boilers for the hot-water heat are of the horizontal return tubular type, size 66 in. x 16 ft., each rated 125 H. P., and having a grate surface 5 x 5 ft. The water-tube boilers are equipped with Green traveling chain grates and the four fire tube type are hand fired. The steam boilers are fed with water from a 600 H. P. Cochrane open feed-water heater by two duplicate Worthington duplex 6 x 4 x 6-in. pumps.

During the more moderate cold

weather only one of the hot water boilers is fired for the reheating of water, and two of the boilers are in use for the generation of steam. The steam boilers besides furnishing steam to the radiation also supply steam for the operation of circulating and vacuum pumps and one fan engine, which drives the fan for the induced draft system, as this method is used in the plant rather than natural draft. The fan for induced draft is of the Sturtevant make. It is 72 in. in diameter, and is driven at an average of 280 R. P. M. by a 10 H. P. engine, having 396 sq. ft. of heating surface made up of brass tubes. This heater is used in addition to the two hand-fired boilers for reheating the circulation water for the hot-water system. This heater was installed to utilize the exhaust steam from the various pumps and stoker and fan engines. In this manner no exhaust steam whatever is wasted.

Three Marsh vacuum pumps, one size 8 x 12 x 12 in., and the two each 5 x 6½ x 10 in., are installed in the pump room and are used for holding vacuum on the steam-heating return

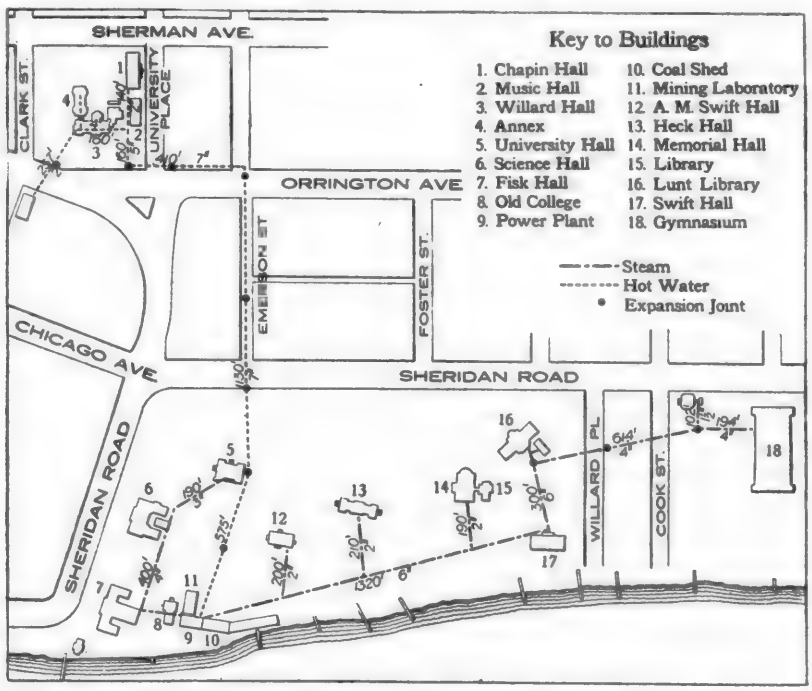


DIAGRAM OF STEAM AND HOT WATER PIPING FOR BUILDINGS OF NORTHWESTERN UNIVERSITY, EVANSTON, ILL.

direct connected to it. Coal and ashes are handled by a hand car conveyor.

For the circulation of the hot water there are installed two Marsh single-cylinder double-acting circulating pumps, size 10x12x12 in., each having a theoretical capacity of 5.87 gals. per single stroke. Both pumps are equipped with Hill pump valves to reduce slippage to a minimum. These pumps are equipped with modern revolution counters so that an accurate record of the water pumped may be kept. There is one large closed heater lines and for handling the condensation from this system.

The hot-water system is equipped with a complete set of recording thermometers which show temperatures of outgoing and return water and outside temperature. In addition to the recording instruments there are regular thermometers on the heater and on the return line.

STEAM HEATING SYSTEM.

The steam-heating system consists principally of direct radiation supple-

mented with indirect in three of the larger buildings. The indirect radiation is for ventilating purposes, there being sufficient direct radiation installed for heating only. Steam is generated in the boilers at a pressure of 80 lbs., and is reduced in the power plant to 40 lbs., at which pressure it is distributed to the various buildings, twelve in number. One to 5 lbs. pressure is carried in the direct radiation and blast coils as weather conditions require, and it is maintained by proper size reducing valves located in each individual building. Belvac thermofier float-type vacuum traps are applied to both direct and indirect radiation in two of the buildings, Swift Engineering Hall and Patton Gymnasium.

The pumps at power plant maintain a vacuum averaging about 10 in., which drops 2 to 3 in. at the point where the returns leave the most distant buildings. The separate return lines are connected into two return mains which lead back to the power plant and are connected through settling chambers to the vacuum pumps in the usual manner. The condensation is then delivered by the vacuum pumps to a receiving tank from which it is delivered by gravity to a feedwater heater and from there is taken by the boiler feed pump and returned to the boilers.

The buildings on the forced circulation hot-water system are heated with direct radiation only. Temperatures and volume of circulation are regulated from the power plant according to the accompanying temperature chart.

The supply and return mains on the hot water system are 7 in. in size to a point midway between Emerson Street and University Place; 5 in. from this point to the manhole at the Music Hall, running 4 in. into Willard Hall and 2 in. to Pearson Hall, with a 2-in. line to Chapin Hall. These lines are run in a special conduit, the bottom of which is made of book tile, used for drain, covered with concrete. The pipes are covered with one thickness of high-pressure covering and a split sewer tile is placed on the top

HOT WATER TEMPERATURES FOR DIFFERENT OUTSIDE CONDITIONS.

Outside	Ordinary		High Wind	
Temp.	Flow	Return	Flow	Return
Deg. F.	Deg. F.	Deg. F.	Deg. F.	Deg. F
60	115	95	125	100
50	120	100	130	105
40	130	105	140	110
35	135	110	145	115
30	140	115	150	120
25	145	120	155	125
20	152	125	162	130
15	158	130	168	135
10	165	132	175	137
5	173	135	183	140
0	181	140	191	145
—5	190	143	200	148
—10	200	150	210	155
—15	210	155		

and well cemented. Expansion joints are placed at regular intervals. The expansion of water is taken care of by an expansion tank placed in University Hall. The total amount of hot-water radiation at the present time is 17,000 sq. ft.

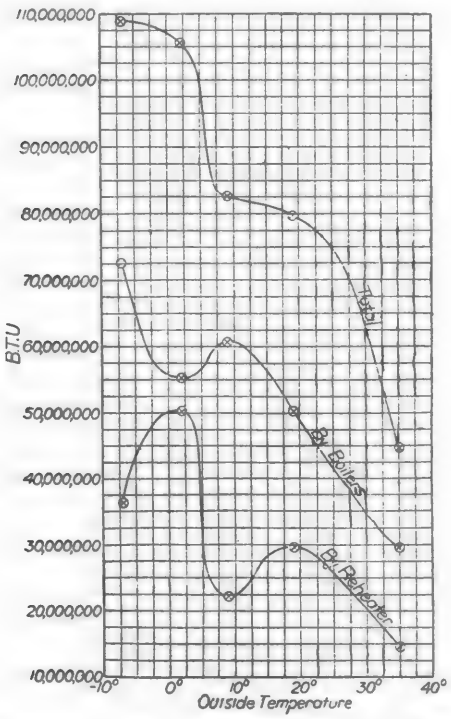
PIPE SIZES.

For the steam system the size of distributing mains are as follows: One 6-in. main for north buildings extending this size to a point between Swift Engineering Hall and Lunt Library through a 6-ft. concrete tunnel and 4 in. from this point to Patton Gymnasium in a wood conduit. The total load on this north line is equivalent to 18 443 sq. ft. of direct radiation. In addition this line supplies heat for a hot-water tank for shower baths and the swimming pool, which contains 66,000 gals. of water. A 5-in. line in a brick tunnel carries steam to the south buildings, reducing at Science Hall to 3 in. for University Hall. The total load on this main is equivalent to 18,443 sq. ft. of direct radiation.

Branch lines are taken from these mains to individual buildings. The return lines are run parallel to the feed mains and are 3 in. in size at the power house. One of the interesting features is the fact that the main return line at Patton Gymnasium is approximately 5 ft. below the high part of the tunnel near Swift Engineering Hall. The expansion of both supply and return mains is taken care

of by slip expansion joints securely anchored at regular intervals.

Feed mains in tunnel are covered with two thicknesses of 1 in. each of sponge felt covering. Return mains are covered with one thickness of low-pressure covering. Feed mains in the conduit are covered with one thickness of high-pressure covering, and packed together with uncovered return mains in oil shavings in a special wood boxing. The north supply man is dripped at Swift Engineering Hall, Lunt Lib-



AMOUNT OF HEAT ADDED TO HOT WATER HEATING SYSTEM IN 24 HOURS.

rary and Patton Gymnasium back into return line through traps. The south main is dripped at Fisk Hall and University Hall in a like manner.

All direct radiation in the buildings heated by steam is controlled by the Johnson system of temperature control, and bypass dampers in fan-ventilating systems are similarly controlled. For economical operation it was found by experience absolutely necessary that this temperature control be installed.

VENTILATION.

The foregoing pertains almost en-

DATA SHEET, HEATING PLANT, NORTHWESTERN UNIVERSITY AT EVANSTON ILL.

STEAM SYSTEM

DATE from 10 A. M. to 10 A. M.	Average Outside Temp. Deg. F.	CONDENSATION—LB. From Radiation Metered	From Hot Water Tank in Gym. Metered	From Reheater Metered	*For Heating Swimming Pool Calc.	In Mains Calc.	For Heating Feed Water Calc.	Total Condensation	COAL BURNED—LB. No. 2 Coal at $2.85 per ton Weighed	No. 5 Coal at $2.35 per ton Weighed	Pocahontas Screenings at $3.00 per ton Weighed	Total Coal Burned	Temp. Swimming Pool Raised Deg. F.	Evap. in Boilers per lb. Coal Calc.	Lbs. Condensation from Reheater Metered	Coal burned in H. W. Boilers No. 5 Coal at $2.35 per Lb. ton.	Ave. Cond. per sq. ft. direct rad. per hour	Cost of Coal for Re-heater	Cost of Coal for Hot Water Boilers	Cost of Coal for Radiation and Mains	Total Cost for Heating Hot Water	*Cost of Coal (for 1000 sq. ft. direct rad. per 24 hr.
Jan. 5-6, 1912	7	273,200	10,000	37,000	7,500	6,200	20,000	354,000	59,760			59,760	15	6.23	37,000	19,915	.211	$8.46	$12.00	$63.93	$220.46	$1.16
Jan. 8-9, 1912	2	245,600	2,000	52,000	6,000	6,200	18,700	330,500	53,795			53,795	12	6.14	52,000	17,390	.19	6.50	8.70	58.43	221.63	1.06
Jan. 9-10, 1912	9	216,200	7,000	23,000	2,400	6,200	15,280	270,080	29,695		10,855	40,550	4	6.06	23,000	8,850	.17	44.99	10.40	48.20	103.59	0.91
Jan. 29-30, 1912	19	172,200	9,000	30,000	3,000	6,200	13,200	233,600	29,250			40,025	6	5.7	30,000	7,210	.14	37.18	15.04	42.00	94.22	0.82
Dec. 22-23, 1911	35	115,600	7,000	15,000		6,200	8,600	152,400	9,410	11,375	19,195	28,605		5.4	15,000	4,790	.092	23.54	9.10	28.72	61.36	0.53

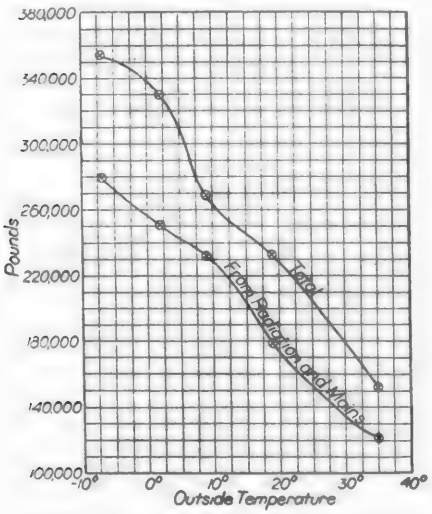
*Includes condensation in mains.

HOT WATER SYSTEM.

DATE from 10 A. M. to 10 A. M.	Average Outside Temp. Deg. F.	PUMP Rev. of Circulating Pump per 24 hr.	Lb. of Water Pumped Calc.	TEMPERATURES Ave. Temp. of Flow Deg. F.	Ave. Temp. of Reheater Deg. F.	Ave. Temp. of Return Deg. F.	Ave. Temp. Added to Water in Reheater	Ave. Temp. Added to Water by Boilers	HEAT Heat Added by Reheater B. T. U.	Heat Added in Boilers B. T. U.	Total Heat Added to Water B. T. U.	Heat Deliv. to Rads. (Calc. 1000 B.T.U. per lb. cond.)	Heat Deliv. to Rads. (Calc. 1000 B.T.U. per lb. coal)	Efficiency of Reheater Per cent.	Efficiency of Boilers Per cent.	Cost of Coal for Re-heater	Cost of Coal for Hot Water Boilers	Total Cost for Heating Hot Water	Cost per sq. ft. Direct Rad. per 24 hr.
Jan. 5-6, 1912	—7	24,965	2,134,807	206	172	155	17	34	38,291,719	72,583,438	108,875,157	37,000,000	112,365,000	98.4	64.6	$8.46	$12.00	$20.46	$1.20
Jan. 8-9, 1912	2	25,306	2,162,549	206.4	157.2	133.2	23.2	25.6	50,171,138	55,861,254	106,032,392	52,000,000	154,440,000	96.5	69.5	6.50	8.70	15.20	0.91
Jan. 9-10, 1912	9	22,486	1,919,913	174.4	144.5	118.5	26	29.9	41,561,744	60,144,256	101,706,000	23,000,000	97,350,000	96.5	69.2	44.99	10.40	55.39	3.24
Jan. 29-30, 1912	19	23,586	1,970,112	151	126	113	13	25	29,718,224	50,149,503	79,867,727	30,000,000	79,310,000	99	57.1	37.18	15.04	52.22	2.82
Dec. 22-23, 1911	35	10,073	1,649,961	144	120	117	3	18	14,546,949	29,693,806	44,540,847	15,000,000	52,050,000	99		23.54	9.10	32.64	2.83

General Data.—Equivalent direct radiation in steam system, 55,080 sq. ft. Equivalent direct rad. in hot water system, 17,000 sq. ft

tirely to the heating. Owing to the fact that no records are kept on the ventilating system, combined with the fact that limited time has prevented making proper tests, very little will be said in regard to this phase of the subject. Fisk Hall, Engineering Building and Patton Gymnasium are the only buildings equipped with a



CONDENSATION IN STEAM HEATING SYSTEM IN 24 HOURS.

fan system of ventilation, and this is used intermittently as required. Science Hall, University Hall and Lunt Library are provided with natural flue ventilation, and in all other buildings no provision whatever is made for the ventilation.

A system of records pertaining to the heating system is kept by the university. It was decided to select five days, the average temperature, of which would be as close as possible to the following: 10° F. below zero, zero, 10° above and 20° and 35° above. Readings and calculations cover coal burned, amount of condensation, temperatures, etc., for these days, all arranged on a comparative basis. The results are here tabulated.

All temperatures shown, excepting those pertaining to the swimming pool, are averages of 24 readings taken hourly between 10 A. M. and 10 A. M. The pump counters, meter and coal readings are taken once every 24 hrs. at 10 A. M. In some instances, where no meter readings were to be had, as in the cases of steam to the swimming pool,, exhaust steam for heating feed-water and the condensation in mains, it was necessary to calculate the amount of condensation to be charged to each, and this was done as accurately as possible from the information at hand. The columns relating to heat, efficiencies and cost are the results of calculations based upon the actual records. In figuring the cost columns no account was taken of anything but coal burned. All curves are based on data taken directly from the figures and are submitted only to show graphically some of the more important items.

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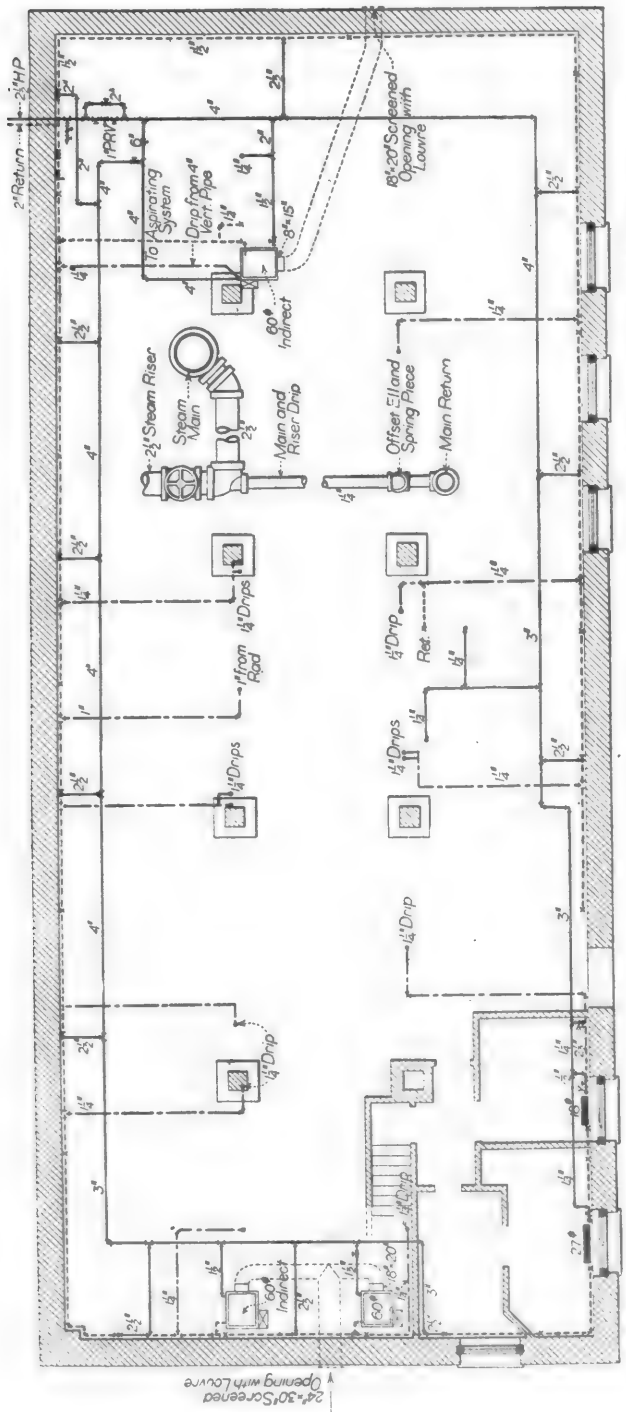
*Ventilation of a Dispensary Building**

By A. M. Feldman.

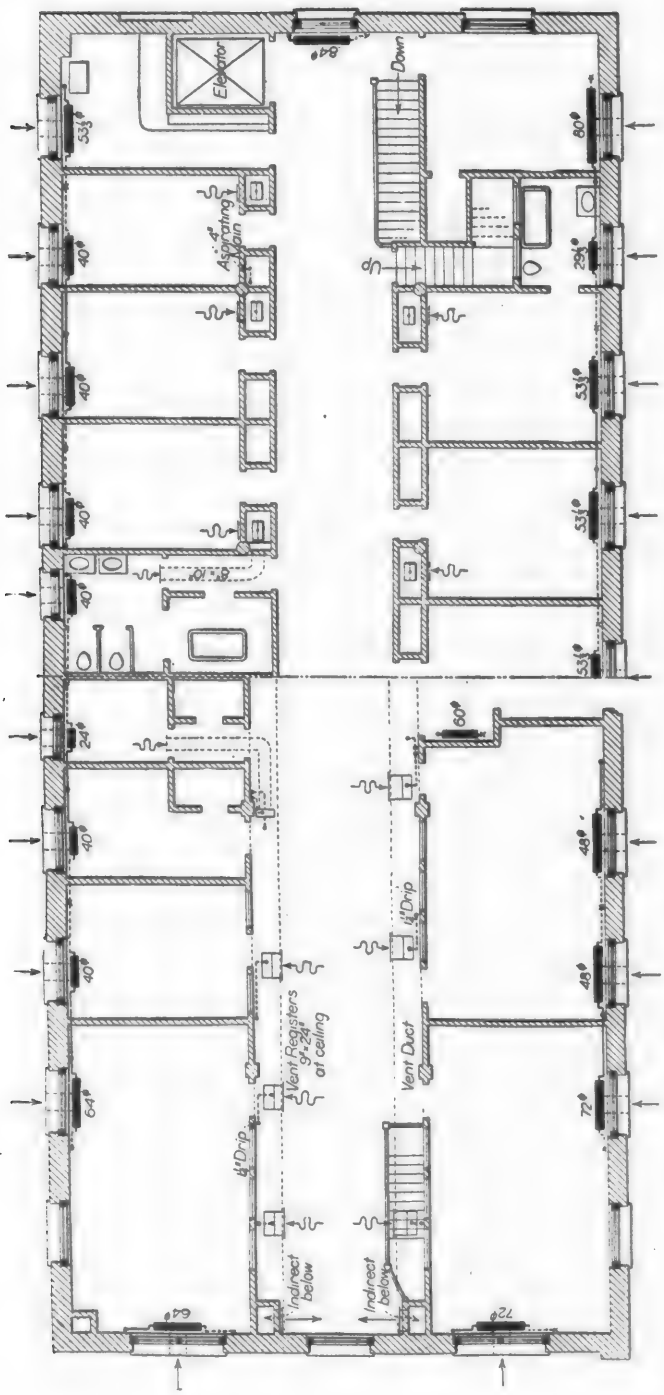
The subject of this paper is the ventilation of a new dispensary building attached to the Lebanon Hospital, New York City. Only one story and basement have been built, but provision has been made for five more stories. The first story contains a main corridor running the full length of the building, with various clinical rooms on both sides. The corridor is intended to serve as a waiting room for patients, and the number of people congregating there at one time is therefore considerable. The author has accordingly concentrated his efforts on the ventilation of the corridor.

The scheme, as will be seen from the accompanying plan, is to exhaust the air from the corridor. For the admission of fresh air all the radiators in the clinical rooms are arranged as direct-indirect radiators, having fresh-air inlets through openings in walls under the windows, with special galvanized iron casings over the radi-

*Read before the American Society of Heating and Ventilating Engineers, Detroit, Mich., July11-12, 1912.



BASEMENT PLAN, SHOWING INDIRECT RADIATORS AND STEAM PIPING SYSTEM.

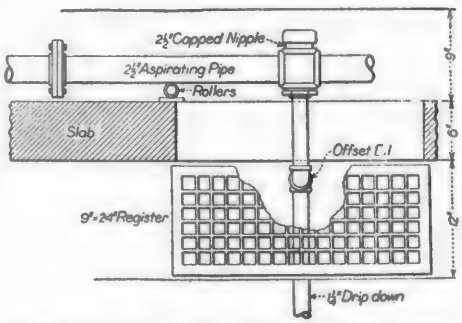


HALF PLAN OF FUTURE UPPER STORY.

HALF PLAN OF GROUND FLOOR.

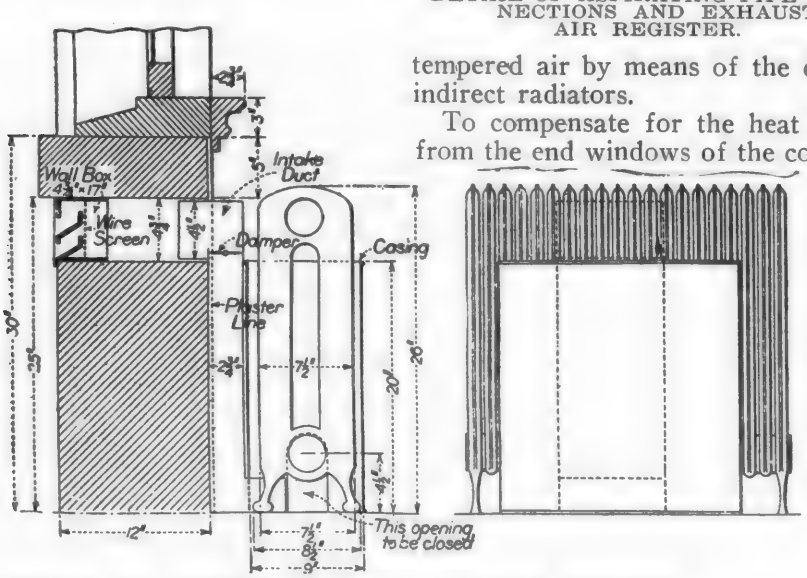
ators arranged so that they can be lifted to get at the radiators for cleaning. Only a few sections of each radiator are enclosed. To prevent cold air by-passing the radiator, the two sections of the radiator next to the ends of the casing are made with solid legs.

Doors are provided with louvers in the bottom panel. Thus the exhausting effect of the system in the corridor is to induce the air flow through the lower panels of the doors from the rooms which are supplied with tempered air by means of the direct-indirect radiators.

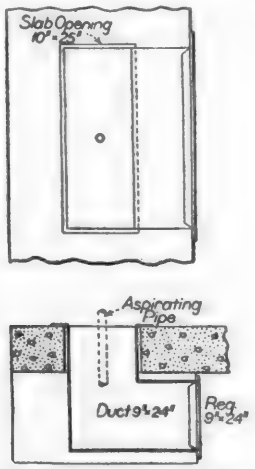


DETAIL OF ASPIRATING PIPE CONNECTIONS AND EXHAUST AIR REGISTER.

To compensate for the heat losses from the end windows of the corridor and to provide an additional supply of fresh air, indirect stacks are provided in the basement. These discharge air through large registers at both ends of the corridor. The ducts and registers are proportioned so that the air is heated not much above 70° F.



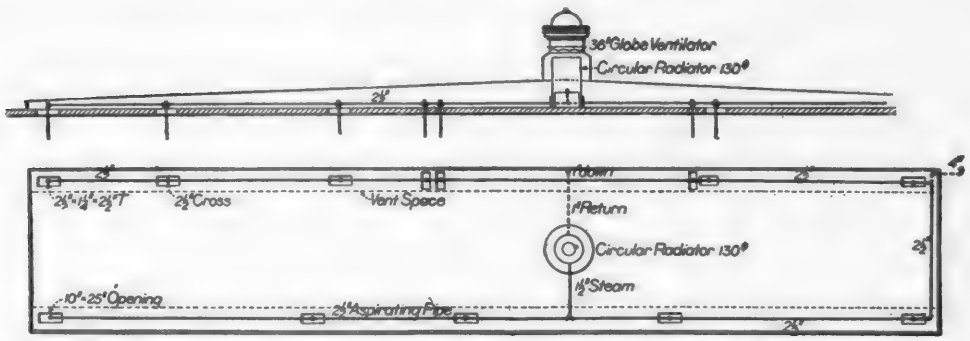
DETAILS OF DIRECT INDIRECT RADIATOR SETTING



DETAIL OF VENT FLUE AT CEILING OF GROUND FLOOR.

Exhaust register boxes under the ceiling of the corridor pierce the concrete ceiling and discharge into a tightly constructed roof space where two 2½-in. steam mains and a 130 sq. ft. circular radiator are provided to furnish heat for aspirating purposes. Tees are provided on the pipes for extending aspirating risers through the future vertical ventilating flues required when the upper stories are built. A typical upper story floor is shown to illustrate the idea.

To make the system fool-proof, no



ROOF PLAN AND ELEVATION, SHOWING SYSTEM OF ASPIRATING PIPES AND AIR VENTS.

dampers were installed in the registers of the exhaust or on the indirects. But to prevent any unnecessary escape of heat after the dispensary closes in the afternoon, one main damper was installed in the ventilator on the roof, operated by means of a chain from the corridor. The damper is made unbalanced so that it will always be kept open unless the chain is pulled down. The system has been in operation the past winter, and has proved a success. The air in all the rooms and main corridor has been described as always sweet. Another feature of the installation is that open windows in any of the rooms give an increased influx of fresh air without drafts with perfect circulation, as the exhaust pulls the air into the corridor.

The heating system has also some novel features. It is a two-pipe installation with a check on the return ends and no air valves on the radiators, but an air valve is provided at the foot of each return riser in the basement. The steam circulation has proved to be perfect with complete air removal and without the nuisance of odors from air valves in the rooms.

High-pressure steam is supplied from the boiler room and reduced at the entrance into the dispensary building. As the latter is located on a lower level than the boiler room the condensation from the heating system is gathered into a non-return trap, which discharges into a return trap. The latter lifts the water to a return tank located in the boiler house and the water is then pumped back to boiler.

Graphic Method of Figuring Delivery of Air Through Ducts

By Burt S. Harrison

Editor's Note.—*It will be noted that the curves on Chart No. 2 are intended to be superimposed on those of Chart No. 1. Our readers may do this by tracing Chart No. 2 on tracing or other transparent paper. For their convenience, however, we have struck off, on strong, thin paper, a number of copies of Chart No. 2, which will be gladly sent to any of our readers on request.*

If air in a plenum chamber be subjected to a maintained pressure, the delivery of air at the end of a duct leading from that chamber will be at a velocity equivalent to the pressure at the end of the duct. This residual pressure will be the maintained pressure in the plenum chamber minus the loss by friction in the duct due to the velocity of the air at the outlet.

If, then, a set of curves be plotted showing the loss by friction in ducts of given size and length for given velocities (the velocities being on the vertical scale and the pressure on the horizontal scale or base), and reading from left to right; and another set of curves be plotted, representing the velocities of air delivery due to different pressures per square inch (the pres-

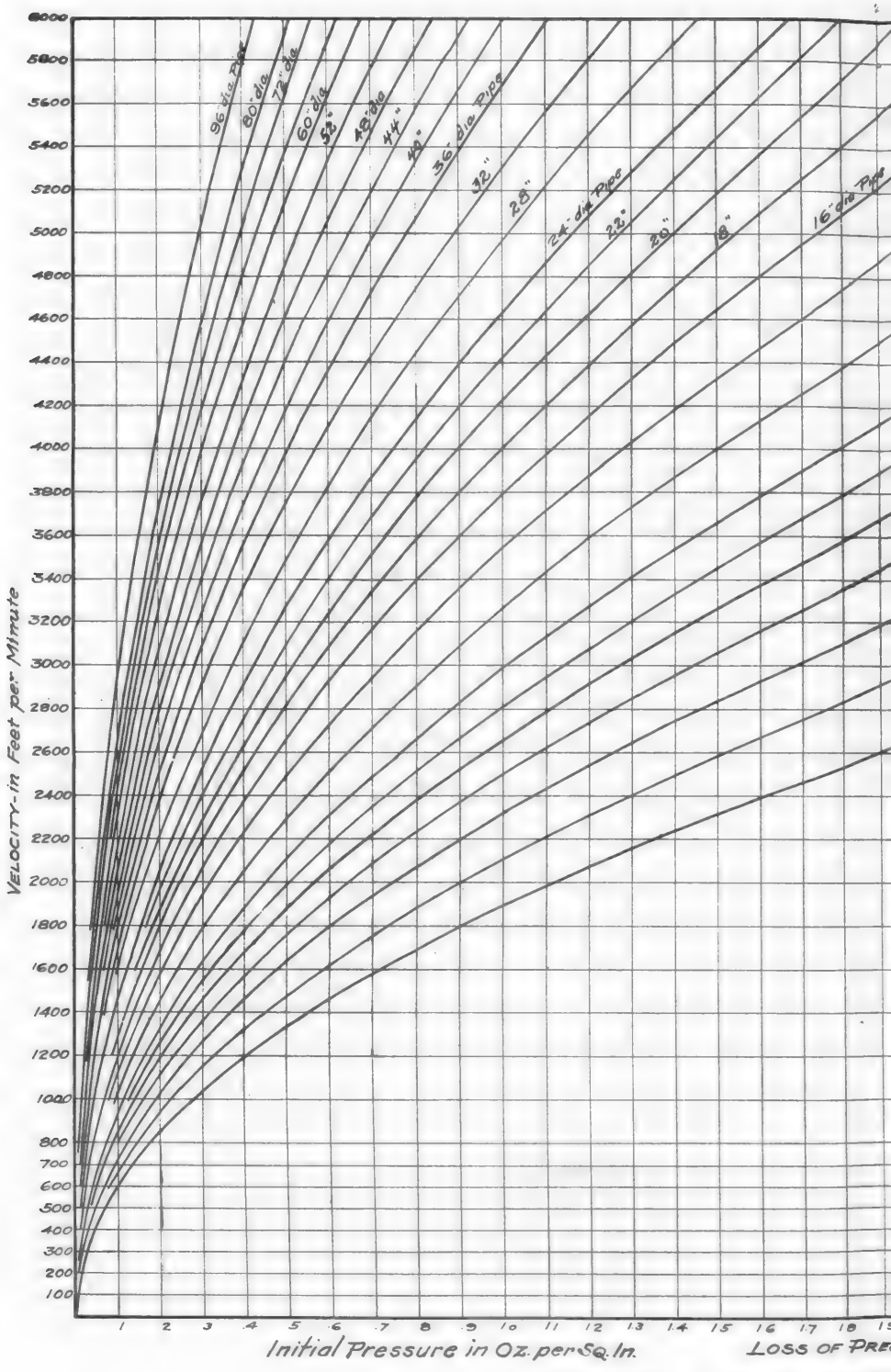
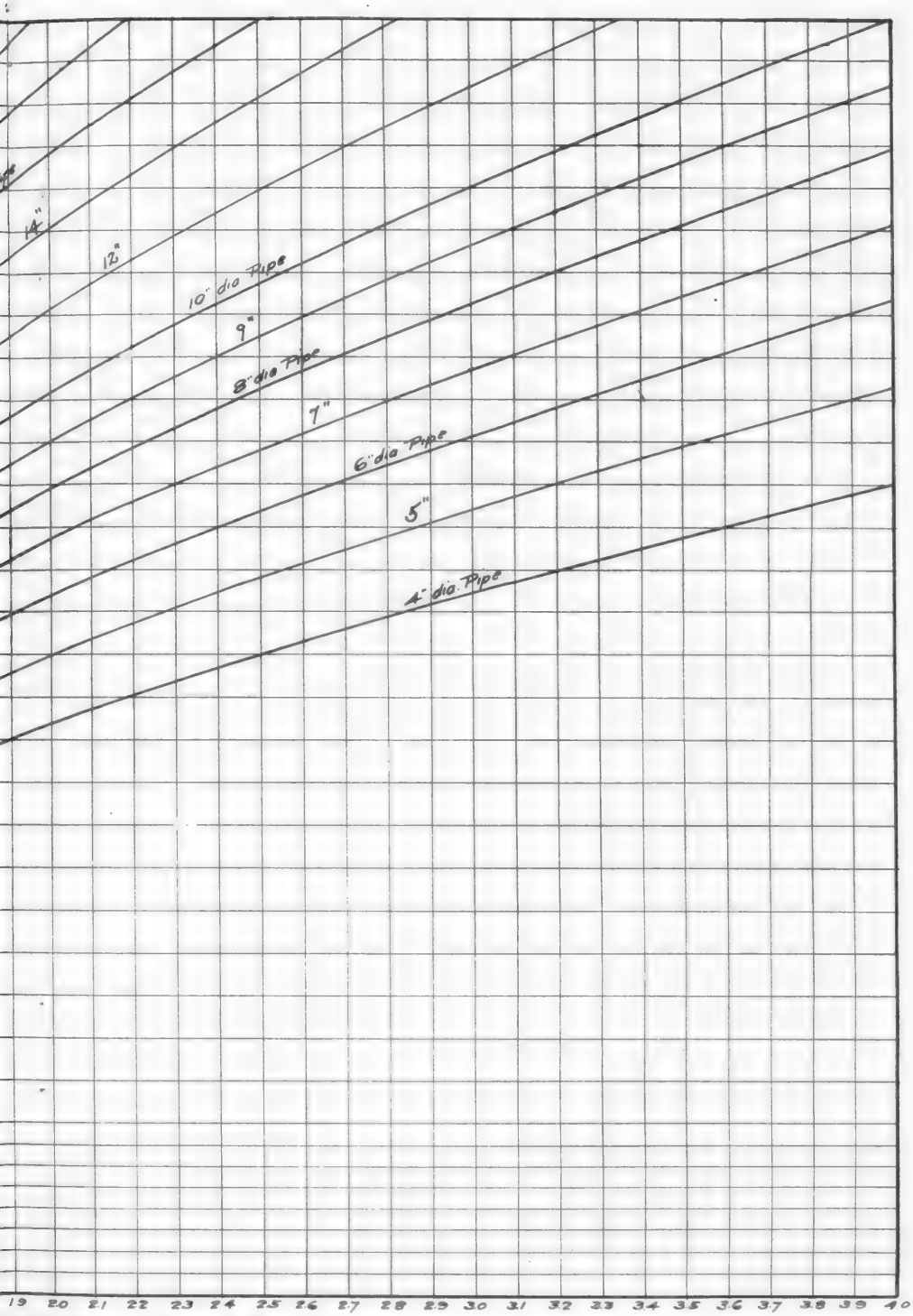


CHART NO. 1—LOSS OF PRESSU



SURE BY FRICTION IN AIR DUCTS.

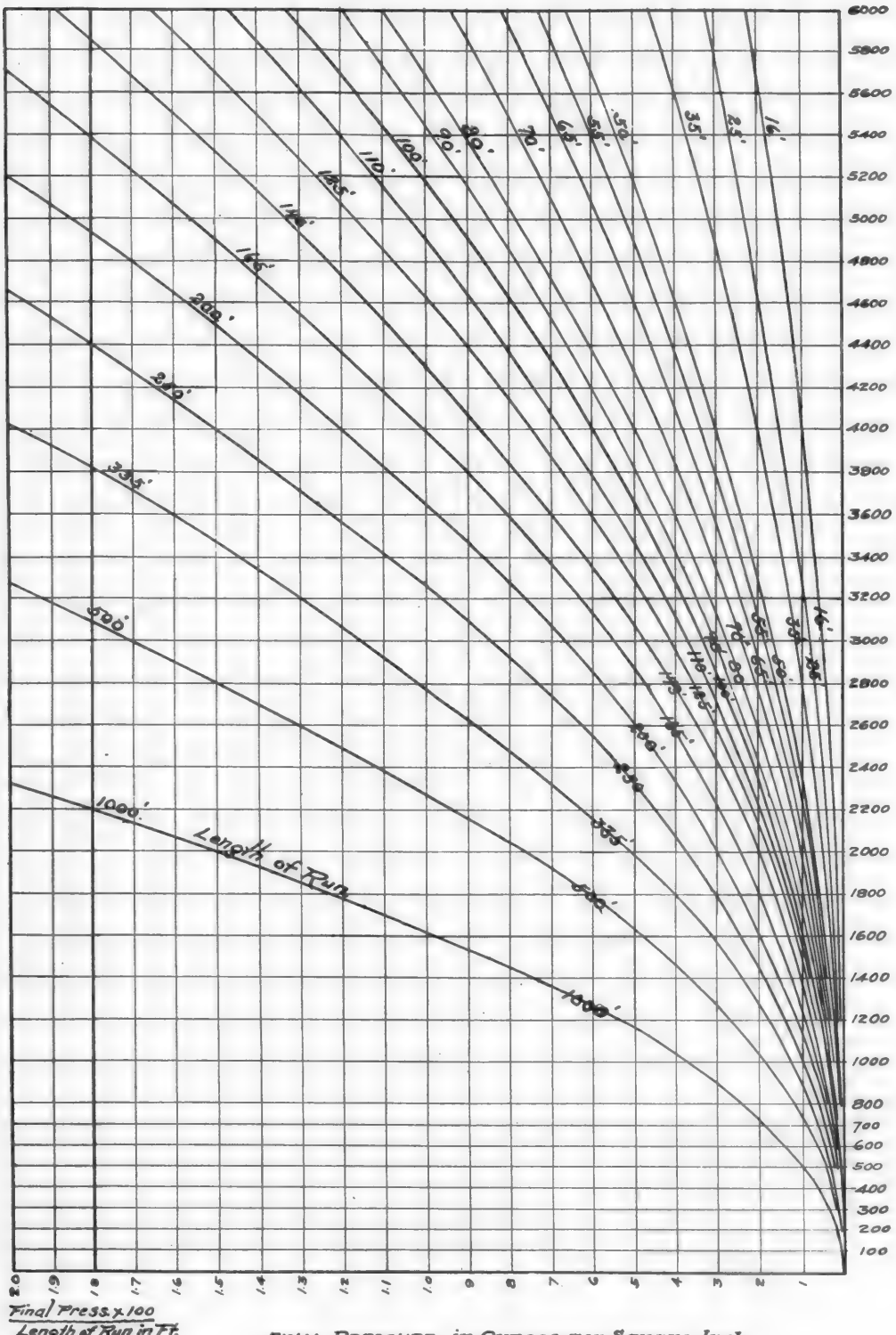


CHART NO. 2—VELOCITIES OF AIR DELIVERY DUE TO DIFFERENT PRESSURES.

(For practical use, this chart should be redrawn on transparent paper, to be superimposed on Chart No. 1.)

sures per square inch being plotted on the horizontal scale) and reading from right to left, then if the second curve be superimposed on the first curve on the vertical line representing the initial pressure of air in the chamber, and having the two base lines coincident, then the point of crossing of the two curves will indicate, when projected horizontally to the vertical scale at the right, the velocity of the air delivery from the end of the duct. When projected vertically downward to the horizontal scale at the base, it will indicate the amount of friction loss in ounces per square inch and the residual pressure at the end of the duct.

On this basis, the accompanying charts are constructed. When drawn on tracing cloth or other transparent material, the friction losses and velocity of deliveries at the end of ducts of any size or length within the range of the charts can be read directly, with no figuring except to get the volume of delivery from the velocity and the area of the duct.

How to Keep Central Heating Station Records

By H. R. Wetherell.

Although it was found by a committee on station records of the National District Heating Association that it would be difficult to establish a system of keeping records that would be uniformly adapted to any type of central station heating plant, still the need of at least some uniformity is clearly apparent, in order that intelligent comparisons may be made of the operation of different plants. The committee stated that a great many of the smaller companies cannot afford to keep up a detailed system of records, while, on the other hand, there are a number of the larger companies which have a system of records established to meet their requirements and would not be willing to change to another system.

The committee concluded, however, that it would be possible to select a few forms, such as a report of the manufacturing and operating expense per sq. ft. of radiation; also, per 1,000 lbs. of condensation, and per 1,000 cu. ft. of space, from which results could be compared.

As a contribution towards this end, the committee, of which H. R. Wetherell was chairman, presented the system of records used by the Peoria (Ill.) Gas & Electric Co., which are reproduced and described herewith:

The company in question started the system, which it is now keeping, ten or twelve years ago. During the first year the system was very crude, but the company has continually added to it each year, until now it feels assured it has a very complete system; however the company is still on the lookout for additional forms of records which may be kept, that would improve its system.

DAILY STEAM REPORT

METER TIME	CONSTANTS METER EXHAUST	LIVE EXHAUST READINGS LIVE	72 237 EXHAUST PRESSURE			DATE 12-19-12 REMARKS	
6 A.M.	240	150	2.1				
7	250		1.7			NOTE ENTER TIME OF STARTING AND STOPPING LIVE STEAM, ALSO ANY TIME THAT ENGINES ARE OPERATING ON THE HEATING SYSTEM.	
8	260		1.5				
9	280		1.8				
10	290		1.5	LIVE	STEAM	OFF AT	6.25 A.M.
11	270		2.5	"	"	ON "	6.45 "
12	220	180	1.8	"	"	OFF "	6.55 "
12 30 PM.	210	220	1.8	"	"	ON "	11.50 "
1	260	100	1.2	"	"	OFF "	10.05 P.M.
2	260		1.8				
3	280		1.25				
4	280		1.2				
5	260		1.2				
6	180		1.7				
7	190		1.2				
8	250		1.2				
9	180		1.9				
10	180		1.7				
11	250		0.5	LIVE	STEAM	ON AT	10.55 P.M.
12	210		1.0.8				
1	200		1.0.7				
2	190		1.0.6				
3	200		1.0.3				
4	180		0.6				
5	200		1.5				
AVERAGE	231	180					
AVE LIVE STEAM PER HR.						LIVE STEAM ON HRS	
EXHAUST " " "						EXHAUST " "	

FIG. 1—FORM FOR DAILY STEAM REPORT.

STATION RECORDS.

Starting with station records; A boiler service report is kept which gives the number of boilers and the time they were put on the line and

PEORIA GAS & ELECTRIC CO. **STEAM HEATING RECORD** ELECTRIC STATION

		DATE								
WEATHER		Max. Temp.								
		Min. Temp.								
		Ave. Temp.								
		Cloudy, Clear, Fair, Etc.								
PRESS.		Heating Main at Station								
		Heating Main at National Hotel								
		Heating Main at End of Line								
STEAM		Total Feed-Water, lbs.								
		Electric Condensing, lbs., Est.								
		Exhaust Steam to H. S., lbs.								
		Live Steam to H. S., lbs.								
		Unaccounted for, lbs.								
		Ave. to H. S., lbs. per Hr.								
COAL		Used Elec. at 5 lbs. per K. W. Hr. Tons								
		Used for Heating System, Tons								
		Total								
BOILERS		Ave. B. H. P. per 24 Hrs.								
		Ave. B. H. P. on Header								
		Ave. Max. B. H. P.								
		Time of Max. B. H. P.								
		Per Cent of Total Rating of Max. B. H. P.								
		Per Cent of Rating in Header of Max. B. H. P.								
GENERATION		Total Non-Condensing								
		Total Condensing								
		Ave. Non-Condensing								
		Ave. Condensing								
		Electric Peak K. W.								
		Time of Electric Peak								
MISCELLANEOUS		Lbs. Water per K. W. Hr., Total								
		Lbs. Water per K. W. Hr., Non-Cond'g								
		Lbs. Water per K. W. Hr., Condensing, Est.								
		Lbs. Water per lb. Coal, Total								
		Lbs. Water per lb. Coal for H. S.								

FIG. 2.—DAILY STATION STEAM REPORT.

banked. This report also shows all repairs made on boilers each day.

Second, they have the engine service report, which indicates the number of hours the various engines and pumps were in service. Notations of all repairs are made on this report also.

Next they have the daily coal handling report which shows the number of men handling the coal and the hours which they work; the number and sizes of cars unloaded and the amount of coal in bunkers and pit.

Fig. 1 shows the daily steam report, which indicates the readings every hour of the steam flow meter, showing the number of pounds of exhaust and live steam used. They also have a recording Venturi meter, showing the amount of water used at all times. There is also a recording thermometer, indicating the temperature of the feed water.

There are charts made by recording gauges daily on the boiler pressure, vacuum, temperature of feed water, and pressure of heating main, just before it leaves the station.

NOVEL RECORDING PRESSURE GAUGE.

There is also a recording pressure gauge at the extreme end of the line. This gauge was developed by an employee of the company in question and

STEAM HEATING DATA

FOR _____ STREET _____ 191

Description of Premises	Contents Cu. Ft.	Exp. Wall Sq. Ft.	Glass Sq. Ft.	Mains and Risers Sq. Ft.	Radiators Sq. Ft.	Total Rad. Sq. Ft.	Est. Rad. Sq. Ft. Plain System	Est. Rad. Sq. Ft. Atmospheric System	Remarks

FIG. 3—FORM FOR STEAM HEATING DATA OF BUILDINGS.

is a great help in the operation of the steam system. This gauge is connected by a system of wires and is so arranged that a duplicate chart is recorded in the superintendent's office and also at the plant, identical with the one at the end of the line. This gauge has greatly simplified the operation of the plant. Before the gauges were installed, it was impossible for the engineer to tell just what pressure was in the main at the end of the line. It was customary at that time to go by the previous day's chart, which was brought in every morning, which, as you all know, is very unsatisfactory. With the present system the engineer operates in accordance with the pressure at the end of the line regardless of the pressure shown at the plant.

Fig. 2, is a copy of the daily sta-

Permit to connect to service issued to _____ 191

Permit to connect to service returned _____ 191

Radiation to be supplied _____ cu. ft. Exposed mains, etc _____ cu. ft. Total _____ cu. ft.

Meter set

Additions, etc.

Steam cut off

Cause

301 APPLICATION FOR STEAM HEAT S

Applicant

To PEORIA GAS AND ELECTRIC COMPANY Peoria, Ill., _____ 191___

I hereby apply for steam heat

at No. _____ Street

for

and in consideration of your laying a steam service pipe into the above premises, up to the inside of the building wall, free of cost to me, I hereby agree to use your steam exclusively for heating such premises for _____ years from date, and thereafter until I shall give you 90 days' written notice to discontinue the supply and to pay for all steam used, at your regular rates, and as provided by your rules (the receipt of a copy of said rules being hereby acknowledged), as per meter registration of the condensation from such steam, it being agreed that you are to receive a minimum amount of $5.00 per month for October, November, December, January, February, March and April in each year

I agree to maintain my heating apparatus as required by your rules and regulations governing the supply of steam for heating purposes. To allow no changes to be made in my heating apparatus without a written permit from you To permit your duly authorized agents to inspect my heating apparatus at any reasonable time, and to give such agents free access to your service pipes, valves and meters on my premises at all times.

It is further understood that I assume any risk of interruption to steam supply due to accidents or other circumstances beyond your control and that you have the right to discontinue steam supply to me upon my failure to pay bills for steam as they become due, for my failure to comply with your rules and regulations or to protect yourselves from fraud

All prior agreements are merged in this instrument and no modification hereof is binding unless made in writing and accepted by your General Manager or other executive officer

This application is not effective until signed by the General Manager or other executive officer of the Peoria Gas and Electric Company

Accepted _____ 191 Signed _____

Gen. Mgr. Applicant for steam heat.

FIG. 2. APPLICATION FOR STEAM HEAT (FRONT AND BACK).

tion steam report. This is kept up every day in the station superintendent's office.

DISTRIBUTION SYSTEM.

We now come to the distribution system, and by way of illustration we will carry a new customer, who has applied for steam, through each step of the system, up to the time the steam is turned into his building.

The customer at the time of making inquiry regarding steam is turned over to the steam superintendent, who after having found that a service can be run to the customer's premises, gives him a general idea of what is necessary and informs him at what time the building can be measured in order that a price can be made.!

The superintendent then sends an order through to one of his assistants, who measures up the building, figures the radiation required and gets all of the necessary data for laying out the system. This information is turned in to the superintendent on a form shown in Fig. 3. The data shown in the heading of this form is kept for each room in all buildings connected to the mains.

As soon as the superintendent has this information at hand, the customer is notified to call at the office, and is advised to the cost of heating his building. If the cost is satisfactory he is asked to sign an application card. which is shown in Fig. 4, and in the meter rate application. If the customer wishes to sign a flat rate contract there is also a form for that purpose.

Specifications are then drawn up on the company's printed form and turned over to the customer to get figures from the heating contractors. If the applicant is the owner of the building, he is asked to sign service card, which gives the company permission to run service pipe into the building and through same to the adjoining premises. If he is not the owner of the building, he is requested to get the owner to sign the same. Service is then run and sketch is made of same by foreman on form for that purpose.

This sketch is made up in detail

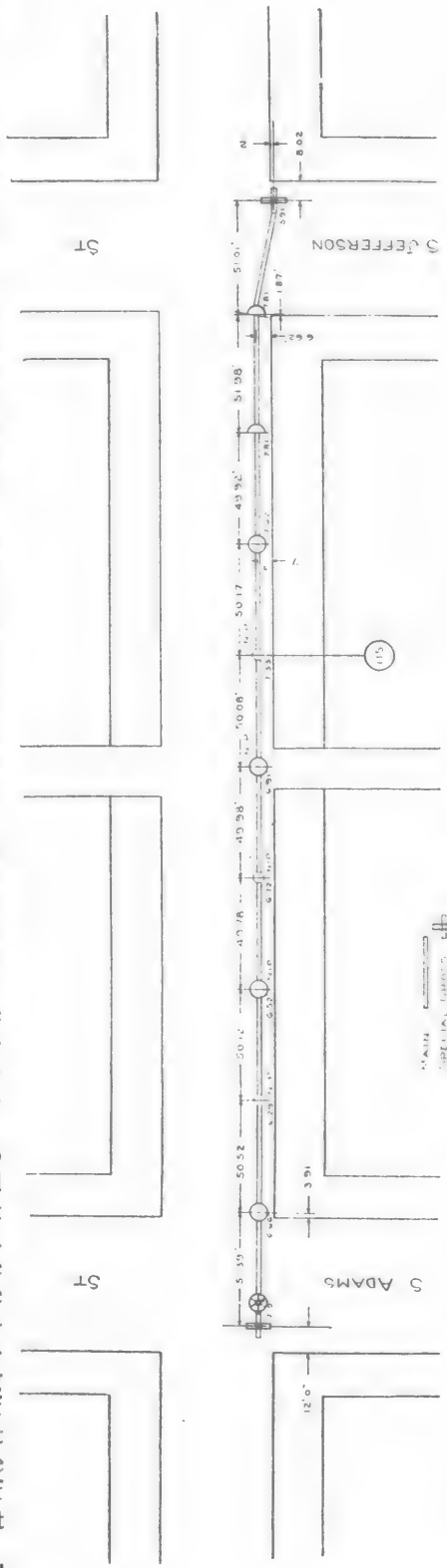


FIG. 5—SHEET FROM PLOT BOOK.

showing dimensions from centre to centre on fittings, and a list of all material used on same is tabulated on the back of sheet. Sketch is then turned into the superintendent's office and information taken off the same as to the size, length and square feet of heating surface, which information is placed on the data sheet from which monthly report is made.

If the service in question is taken off of the main, it is plotted on the Plot Book. Sheet from Plot Book is shown in Fig. 5. Sketch is then filed in envelope with the number of service marked on same. Envelopes are filed in numerical order. Sketches of all service extensions are filed in their respective envelopes.

There is also a sheet on which the steam order and complaint record is kept. This record is for the purpose of keeping track of all order and complaint cards from the time they are written, until they are filed away in the superintendent's office.

After the system has been installed in the customer's building and is found O. K. by the company's inspector, a steam meter order card is made out and turned over to the meter department.

When meter is set, the necessary information as to the size, number, location and index, is placed on the card by the man who sets the meter and is turned back into the superintendent's office.

Meter record card is then filed away and meter order card sent to the bookkeeper in order that he may get statement of meter entered on the ledger. This card is then returned to the superintendent's office and filed. Meter record card has a record of all times that meter has been set and removed, and on the back of same a record is kept of all tests and repairs made on meter. These cards are filed in numerical order.

Radiation is now checked and detailed report made out on form as shown in Fig. 3. These forms are filed in loose leaf binders and indexed.

561—500—1-19

PEORIA GAS & ELECTRIC CO. STEAM METER READINGS

STREET NO.

NAME

Meter Location	
Meter Size	
Meter Number	

Date		Statement Lbs.			Difference M. Lbs	Est M. Lbs	Total		Last Year Total	Last Year Est	Remarks

FIG. 6—STEAM METER READINGS.

Permit card is also filled out at this time. These cards are filed according to street numbers and show the customer's name, address and consumer's number. This card is double faced, and on the back of same a record is kept of the amount of radiation connected on each floor of the building, both in risers and radiators, together with the size of the service valve, traps, the date of the last check, etc.

A consumer's record card is also

Form 517—6-11-100

PEORIA GAS AND ELECTRIC COMPANY

SUPERINTENDENT'S REPORT, STEAM DEPARTMENT, FOR MONTH OF ..... 191 ....

MANUFACTURING	THIS MONTH		SAME MONTH LAST YEAR	
	SCREENINGS	MINE RUN	SCREENINGS	MINE RUN
Coal used for Heating System, Pounds				
DISTRIBUTION				
Average Temperature				
" Steam Pressure, in Mains, Pounds per Square Inch				
Steam Sold, pounds (Metered)				
" " " (Not Metered)				
Condensation in Mains and Services, Pounds				
Total Steam Sent Out, Pounds				
	Per Sq. Foot Per Mo.	Per Sq. Foot Per Hr.	Per Sq. Foot Per Mo.	Per Sq. Foot Per Hr.
Condensation in Mains and Services, Pounds				
CONSUMERS' RADIATION	NUMBER	SQ. FEET	NUMBER	SQ. FEET
Consumers First Day of Month				
" Connected During Month				
" Disconnected During Month				
" Last Day of Month				
	Per Sq. Foot Per Mo.	Per Sq. Foot Per Hr.	Per Sq. Foot Per Mo.	Per Sq. Foot Per Hr.
Condensation Consumers' Radiation, Pounds				

METER REPORT

	A	B	00	0	1	2	3	4	6	TOTAL
In Use First of Period										
In Shop First of Period										
Total Owned First of Period										
Bought During Period										
Condemned or Lost During Period										
Total Owned Close of Period										
" " First of Fiscal Year										
Inc This Year in Total Owned										
In Use First of Period										
Set During Period										
Removed During Period										
In Use Close of Period										
In Use First of Fiscal Year										
Gain or Loss to Date										

STREET MAINS (IN FEET) (COMPLETED WORK)

SIZE Inches	In Use First of Year	Laid This Month	Previously Reported This Year	Total This Year	In Use Close of This Month	Sq. Ft. of Heating Surface in Mains
3						Con. First of Month
4						
5						Con. During Month
6						
8						Con. Last of Month
10						
12						LBS. OF WATER PER LB. OF COAL
14						
16						This Month / Same Mo. Last Yr.
18						
Totals						

FEET OF SERVICE PIPE LAID	This Month	Previously Reported	Total for Yr	REMARKS
Complete Services				
Extended "				
Total				

SERVICES	NUMBER	SQ FT SURFACE
No. Services Laid First Day of Mo.		
" Ser. Laid from Old Mains This Mo.		
" " " " New " " "		
" Extended Services		
" Services Laid Last Day of Mo.		

SUPT _____

FIG. 7—FORM FOR SUPERINTENDENT'S MONTHLY REPORT, STEAM DEPARTMENT.

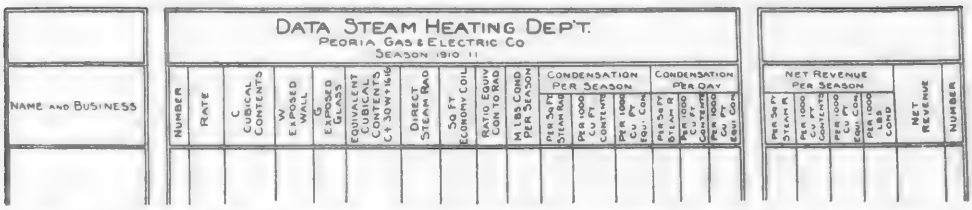


FIG 8—FORM FOR YEARLY REPORT OF STEAM HEATING DEPARTMENT.

made out at this time. These cards show the customer's name and address and customer is given a number. Cards are filed in numerical order and are used for an index to the detail steam data books.

There is a form of meter test card on which a record of meter tests are made; and also a monthly complaint record. This report shows the number of complaints each month in comparison with the same months of the previous year; it also shows the cost of labor in taking care of complaints.

Fig. 7 shows the form of the monthly steam report. This report shows the number of pounds of coal used for steam heat for the month compared with the same month of the previous year, the average pressure and temperature and the amount of steam metered. Also shows the amount of radiation connected. Gives a full report of the meters, mains and services. A report of this kind is also made up for the year.

The company in addition has its monthly and yearly cost reports. It also makes out a yearly condensation report on which it shows a record of each customer's meter for the year. The heading of this report is shown in Fig. 8.

Fig. 9 is a blank copy of one of the company's monthly cost sheets.

It was the committee's opinion that a form similar to the last figure might be adopted by the association, in order that the members might compare their generating and operating costs.

PEORIA GAS AND ELECTRIC COMPANY

STEAM HEATING REPORT FOR MONTH OF _____ 1912

	Generation Exp.	Labor	Material	Total	Total Last Year	Cost in Cents Per Sq.Ft. Radiation This Year	Cost in Cents Per Sq.Ft. Radiation Last Year	Cost In Cents Per M. Water This Year	Cost In Cents Per M. Water Last Year
401	Station Superintendence								
402	Boiler Labor								
408	Fuel for Steam								
414	Station Expense								
415	Repairs of Steam Equipment								
	Distribution Exp.								
425	Distribution Superintendence								
426	Miscellaneous Operating Labor								
427-A	Meter Resets & Removes								
427-B	Turn-offs and Shut-offs								
428-A	Maps and Records								
428-B	Distribution Office & Shop Expense								
429	Repairs of Street Mains								
430	Repairs of Services								
431	Repairs of Regulators								
432	Repairs of Customers Meters								
432-A	Salaries & Expenses								
432-B	Meter Repairs								
432-C	Meter Testing								
432-D	Meter Dept.Expense								
	Utilization Expense								
433	Inspection of Customers Premises								
434-A	Complaints & Investigations								
434-B	Gratuitous Work								
435	Loaned Appliance Expense								

OUTPUT AND SALES FOR PERIOD

	This Year	Last Year	Inc.or Dec.	Percent
Total Sales				
Loss				
Delivered to Mains				

FIG. 9—MONTHLY COST SHEET FORM.

THE HEATING AND VENTILATING MAGAZINE

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Secretary and Treasurer, G. PETERSEN

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MODERN sanitary safeguards are becoming well known to the general public. The bubbling water faucet is a familiar sight. Sanitary drinking cups are in wide use. The people have been fairly surfeited with suggestions and admonitions for the care of their health. No reader of current literature can longer claim that he does not know the meaning of fresh air or the importance of maintaining an adequate supply of it in his office and home. The danger is now rather that constant repetition will tend to dull the interest and that continual watchfulness will become wearisome. The fact is that the best of modern safeguards will not be permanently accepted until the public has thoroughly adapted itself to sanitary ways of living.

In the field of ventilation, the work has been well commenced by pointing out, in plain terms, the dangers of bad air, and other sources of menace to health. This may well be said to be the first period of the nation-wide campaign of education in sanitary knowledge. We believe we are on the threshold of the second step, involving the enforcement of sanitary measures by men especially chosen for that purpose. The establishment, for instance, of a ventilation inspection bureau in connection with the Chicago Board of Health is one of the first moves in this direction. The passage of State ventilation laws might be given first place, but we are referring here to the enforcement, rather than to the enactment, of such laws.

A proposal lately advanced by a committee on heating and ventilation of the Canadian Society of Sanitary and Heating Engineers is to the effect that "an expert heating and ventilating engineer should be made a member of the Provincial Board of Health in every Province." This is equivalent to advocating in this country a heating and ventilating engineer for every State health board. In this and similar ways the people will be obliged to take cognizance of the provisions that are being established for their better health and comfort and, we may hope, will eventually become so accustomed to them that the third and last period may be reached when the demand for compulsory ventilation will be fulfilled as a matter of course.

Compulsory ventilation through local inspection and supervision may not be the ultimate practice in maintaining the fresh air movement, but at present it is obviously the most effective method that could be devised in maintaining the now thoroughly-aroused interest of the people in the matter of fresh air.

Problems in Pressure Reduction and Regulation.

Quite a large percentage of regulating valves installed are giving poor service or are expensive to maintain or are worthless, due to one of the four following causes: Either they are too large for the service required; are installed too near an engine; are installed without a strainer to protect the seats against obstruction and injury by small particles of scale, cuttings, grit and other foreign substance; or else they are of improper design and construction.

The most frequent causes of failure are in the order given above.

Remembering that pressure reduction in flowing steam is caused by friction alone, and that in order to reduce dry steam of 100 lbs. pressure to a uniform delivery pressure of about 50 lbs. will require a velocity of flow past the regulator seats of over 50,000 ft. per minute, and that the average flow of steam in the pipe to an engine is generally between 5,000 and 6,000 ft. per minute you will quite readily see that an actual opening in the regulator seats equal to about 1-9 the area of the pipe will be sufficient to supply the engine.

The velocity for a given reduction will be just exactly the same, whether a regulator the full size of the pipe, or a smaller one is installed; but if the full size regulator is put in anywhere close to the engine, the small amount of lift from its seat will cause it to hammer the seat, or open and close violently with each cut-off or stroke of the engine.

If the full size regulator is installed far enough away from the engine to prevent effects from pulsation as stated above, then the slight opening of seats will cause excessive wire drawing and will quickly wear away the regulator seats from flow and obstruction.

PERFORMANCE DATA.

Under the conditions of pressure as stated, a regulator of about one-fourth the capacity of pipe to the engine, and located a considerable distance away, or also a receiver installed between the regulator and engine would give best service, and last the longest.

Under very high boiler pressure, or with superheated steam, the proportioned size of regulator to pipe which it is to supply should be smaller than one-fourth capacity just stated.

In average installations of reducing and regulating valves for steam heating, and kindred service, with boiler pressures of 80 to 100 lbs. or more, reducing to delivery pressure of 0 to 10 lbs. the steam flows past the regulator seats at a much greater velocity than for engine installations, velocities in heating service being quite often as high as 75,000 to 80,000 ft. per minute, especially on very dry or superheated steam.

For an average modern heating installation, requiring a 6 in. reduced pressure main and carrying a pressure of 2 to 3 lbs. reducing from a boiler pressure of 100 lbs. or more, a reducing and regulating valve of proper construction having a single seat opening of 1¼-in. to 1½-in. diameter is of ample size and would give good and lasting service. A double seat regulator of the same size, or a single seat regulator of twice the diameter, or 2½ to 3-in. diameter, would open so slightly under normal service conditions, that the seats would be very much subject to obstruction and injury by scale, cuttings, and other foreign substances which are nearly always present in pipe lines and fittings; and, in addition, the larger seat regulator would be subject to excessive wire drawing action on the seats and will quickly wear out.

With proper construction of reducing and regulating valves, there is no difficulty in reducing from the highest possible boiler pressure, with a single reduction to any delivery pressure required, even down to atmospheric pressure, or 2 or 3 lbs. below, provided the proper size of reducing and regulating valve is used, and that it is protected by a proper form of strainer—*A. W.* CASH, *before the Illinois State Association, N. A. S. E., May* 23, 1912.

A Method of Promoting Export Trade.

A plan for putting American Manufacturers of engineering supplies in touch with foreign buyers is being worked out on an extensive scale by the Commercial Bureau Co., 50 Church St., New York. This company has, for many years, maintained a manufacturers' library at its headquarters in New York, in which the manufacturers' catalogues were filed and sub-indexed for reference and which contained practically every trade journal in the country, the use of the library being free to manufacturers and buyers, both local and those visiting New York.

The company has been permitted by the State department to undertake the same service for American manufacturers in all lines of industry, by distributing its carefully-briefed sets of card catalogues to the American consuls all over the world. This work is now being undertaken by the company's Foreign Commercial Bureau. In addition to sending out the original card catalogues, the bureau will send each month to the consular offices the new cards received from its subscribers. To place in the hands of the buyers the actual catalogue, branch offices of the bureau will be established in the principal cities of South America, Africa, Asia and Australia. The bureau estimates that, upon the completion of its system, it will be in a position to place the American manufacturer in direct touch with at least 10,000 buyers from all parts of the world.

The Manufacturers' Standard for Flanged Fittings and Flanges.

The principle features of the "Manufacturers' 1912 Schedule" of Standard Weight and Extra Heavy Flanged Fittings and Flanges, as well as the main points of difference between this schedule and the "1912 United States Standard" schedule, are contained in a statement issued by the Committee of Manufacturers on Standardization of Fittings and Values. It will be recalled that the manufacturers adopted their schedule July 10 last, to go into effect Oct. 1, 1912. Their statement is given herewith:

The standard recently adopted jointly by the National Association of Master Steam and Hot Water Fitters and the American Society of Mechanical Engineers and known as the "1912 United States Standard," is the outgrowth of an effort on the part of the two societies to establish a universal standard for flanged fittings and flanges for working steam pressures in ordinary use at the present time.

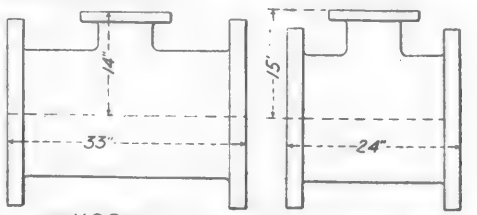
Without question, a universal standard is necessary and highly desirable, but any standard to be commercially successful must be designed to bring about the desired uniformity with the minimum inconvenience and expense, both to the consumers and to the manufacturers.

Before the "1912 United States Standard" was adopted by the two societies mentioned, there existed among the majority of manufacturers in the United States, a generally accepted standard for flanged fittings and flanges. Most of the large flanged fittings manufacturers in this country had the entire pattern equipment necessary to build this line of goods and many had list prices and dimensions published for general distribution to the trade; in fact, these dimensions have been published in Kent's pocket book, 8th edition.

After having thoroughly investigated the conditions which induced the two societies to adopt the "1912 United States Standard," the manufacturers of flanged fittings and flanges throughout the country realized that certain changes in the generally accepted standard were desirable. The tendency of modern engineers to use higher steam working pressures than was their practice some years ago has demonstrated the necessity for an increase in the strength of extra heavy end flange bolting in the larger sizes. In drafting the "1912 United States Standard," the American Society of Mechanical Engineers provided an increase in the bolting of large extra heavy flanges; but this increase seems out of proportion with the necessities of steam engineering practice. The manufacturers have, therefore, adopted a happy medium and have increased the bolting on these extra heavy flanges, but have been more practical in this increase than the "1912 United States Standard."

So far as the strength of the fittings themselves, not considering the bolting, is concerned, the "1912 United States Standard" has no advantage whatever over the Manufacturers' Standard.

While the "1912 United States Standard" provides larger center-to-face dimensions on many straight sizes, this change was not brought about by any attempt to better the fittings, but was an average of several published sets of dimensions which, in many cases, were out of date and did not correspond with the goods being made by the respective manufacturers.



COMPARISON OF REDUCING FITTINGS AS MADE IN ACCORDANCE WITH MANUFACTURERS' AND U. S. STANDARD SCHEDULE.

This change alone would require a large expenditure for patterns and shop equipment, without a commensurate advantage to the consumers.

The increase in bolting in the "Manufacturers' Standard" compares very favorably with the table of dimensions on "A Standard for High Pressure Steam Lines," issued by the Society of German Engineers in 1900; also the report issued by the Engineering Standards Committee on British Standard Tables of Pipe Flanges.

While the "1912 United States Standard" provides much heavier bolting on the very large extra heavy flanges, this excessive increase does not seem necessary, as the "Manufacturers' Standard" bolting is just as strong as the "1912 United States Standard" on the sizes which include the great majority of pipe lines; namely, the 10-inch size and smaller.

The "Manufacturers' Standard" is much more economical for the consumer of the future, in avoiding mistakes when making changes and additions to his plant, as no change is made in the center-to-face dimensions from the present "Manufacturers' Standard." This standard is also economical for the manufacturer, as he can use his present equipment, which, to a large extent, is made up in very substantial fashion and cannot be changed without involving a very high expenditure.

Furthermore, the "1912 United States Standard" will naturally create a great deal of confusion to the consumer, job-

ber and manufacturer alike, as it would necessitate carrying two stocks of fittings for several years or until the new standard is fully in effect. The "Manufacturers' Standard" will not cause this difficulty.

The "Manufacturers' Standard" for reducing fittings is a much better design than the "1912 United States Standard," as the fittings are more in proportion with the straight sizes. The "1912 United States Standard" has the same dimensions on the run of reducing fittings as the straight sizes, regardless of reduction. It will be readily seen that the proportions of a reducing fitting will not be in harmony with those of a straight fitting. This is illustrated by the cut which shows a fitting drawn to the same scale, using the "Manufacturers' Standard" and the "1912 United States Standard."

To sum up the situation, it is quite apparent that the "Manufacturers' Standard" has all the merits of the "1912 United States Standard" without the disadvantages. While the opinions of some engineers may be in favor of heavier bolting on the larger extra heavy flanges, it does not seem consistent nor necessary with present steam engineering practice.

It would seem apparent that the excessively large bolt diameters specified in the "1912 United States Standard" for the larger flanges are much too cumbersome and inconvenient from the steam fitters' standpoint, while the bolt sizes specified in the "Manufacturers' Standard" are more in accordance with general practice. In a standard of this nature convenience as well as strength should be a governing factor.

We feel confident that the public at large will express their preference for the "Manufacturers' Standard," and while the manufacturers may be accused of not taking an interest in the "1912 United States Standard" from its inception, their recent action in adopting a universal standard which is fully in accord with the requirements of the engineering trade, will demonstrate that they are acting with absolute sincerity and with a fair-minded attitude towards all interests involved.

Depreciation in Underground Steam Mains.

An instance of the efficiency of well-constructed underground steam mains was given by William Jennings before the National District Heating Association in describing the experience of the Harrisburg (Pa.) Steam Heat & Power Co. He stated that while the original method of construction permitted of a very low charge of between 3% and 4% for depreciation of underground systems, these figures could be lowered by 20% in the case of systems put in during the past five years, built with better underdraining, better insulation and better designed expansion devices.

The Harrisburg plant, he stated, was installed in 1887, the underground work being placed in a gravel and loam sand soil, having one line of the pipe placed in the center of the ditch, underneath the steam main. The wood log was bored out of the solid log, male and female ends, rolled in tar, laid without paper over the joints. Bar iron straps were carried along the entire line for anchoring.

Good charcoal iron "line pipe" for steam mains was used, and expansion and contraction provided for by means of expansion devices known as variators. The service pipes were taken out of the bottom of mains on the original installation, but changed later. The plant has been in successful operation ever since.

In 1907, owing to increase of business, principally on a street that had developed beyond the expectation of any one, and by the excessive pressure necessary on the street mains, it was decided to enlarge part of the underground system by taking up the smaller main and re-laying with a larger one.

The old line was laid in a loam and soil. It was found that the wood pipe casing, while charred on the inside to a possible depth of an inch was solid and, except where a water pipe or sewer had leaked on it, was in a good state of preservation, except where the ends were exposed in the brick work at the variators. The iron pipe had no leaks and showed bright and clean, the only sign of wear being a slight depression on the bottom side of the pipe, which however was negligible in considering the further life of the pipe.

The same conditions were observed in later changes, the last being in the summer of 1911. Part of this last operation was in gravel, and here the wood pipe was in most excellent condition.

The company still has 12,650 ft. of the original installation, including the variators; and while the line of pipe may be more easily followed when the snow is over it than the later installation, yet the company does not find the depreciation in efficiency enough to warrant changing the old for the new.

The greatest trouble from leaks experienced in the last five years has been the leaking of service pipes; the company has not had more than five or six leaks in the steam mains proper. On account of the sulphur in the feed water there has been considerable action of (static) electricity in the system, from which trouble was expected, but at this writing there has been no evidence of any. The drain tile in the gravel soil was found to be open clear, and in the loam soil some little of the tile was closed entirely and others partly so. In all of the later installations care has

been taken to surround the drain tile with adequate porous material so that perfect drainage is assured.

This experience has been confirmed by other plants in the vicinity and by careful investigation made by interested parties.

Of course, there is always the possibility of an increase in the business to such an extent that the mains installed may become too small for economical operation, and in order to take care of this feature, a charge of from 4% to 5% of the cost of the underground system would be sufficient for the item of depreciation and replacement.

Legal Decisions

Provision for Notice of Defects to Surety Company—Construction.

A heating company sued a surety company on its bond to insure the performance of a contract entered into by another party and the heating company, whereby said party agreed to install the Schott hydro-vacuum system in the plaintiff's heating plant. The consideration for the work, as provided by the contract, was $4,500, to be paid in installments as the work progressed, as follows: $1,850 when pipes, etc., were on the ground; $1,400 when the pump was on the ground; $400 when connecting chamber was on the ground; $400 when the work was "erected complete, ready to start"; $450 as soon as it was placed in operation and found to be operating successfully. The plaintiff's petition alleged that the contractor entered on the performance of the contract and endeavored to install the system in connection with plaintiff's power plant, and erected it and tried to operate it; but after its erection the system failed to work. It also alleged that "plaintiff has made all the payments of money to said contractor as stipulated in the contract." It was held that the complaint must be taken to aver that all the payments provided for in the contract were made by the plaintiff except the last one, which was not due until after the system should have been successfully operated, as guaranteed.

The system was a complicated one, and the contract guaranteed that all the steam taken from the city light plant, for use in connection with the heating system, would be taken away without back pressure on the engines of the light plant, and would create a partial vacuum at the light plant, except at a particular time, when the commercial and street lighting loads overlapped, i. e., "the peak"; the peak supposedly being of from 15 to 60 minutes' duration.

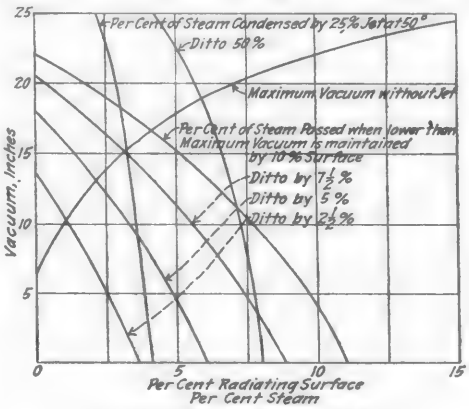
The contract further guaranteed an increase of 50 per cent. in present pumping capacity, and provided that title to the device should not pass to the plaintiff until the plant should have been fully paid for. The surety bond provided for notice to the surety, within 24 hours, of any act, omission, or default on the part of the contractor, which might involve a claim or loss. In construing this provision it was said by the court that it might have been believed by both the contractor and the plaintiff that, when the latter discovered the defect in the device, it could have been remedied by adjustment of the parts or otherwise; and it was held that the provision did not require notice on the plaintiff learning of a defect, but only on the discovery that the defect possibly could not be remedied by the contractor. Judgment for the plaintiff was affirmed.—Illinois Surety Co. v. Frankfort Heating Co., Illinois Supreme Court.

Proposed Method of Testing Radiator Steam Traps.

In an effort to develop a standard method of testing radiator steam traps for return line vacuum heating systems, the committee on tests of The American Society of Heating and Ventilating Engineers has submited some suggestions on which the comments of those interested are desired. The chairman of the committee is James A. Donnelly, 132 Nassau St., New York. The suggestions of the committee are as follows:

1. The appliance should be tested upon several radiators at the same time in order that a fair average may be secured.

2. They should be connected to the return line and vacuum pump in the ordinary manner; the total amount of sur-



VACUUM HEATING CHART.

face in the return line to be about 10 per cent. of that in the radiator under test.

3. Several tests should be made with the pressure varying about as it might be expected to in ordinary practice, from atmospheric or slightly below to about 5 lbs. gauge.

4. The vacuum pump to be run at such a rate of speed that it will have about the capacity as in ordinary use, or

ten times the displacement of the water handled.

With this arrangement the committee believes that the efficiency of different devices under test may then be observed by the amount of condensation collected and by the amounts of vacuum maintained upon the return line. Those devices passing the least steam will give the lowest absolute pressure. If the temperature of the water and steam leaving the radiators is noted, the percentage of steam may be easily determined.

Accompanying the suggestions is a chart, illustrated herewith, showing the vacuum which may be maintained with varying percentages of return surface (or, perhaps more accurately speaking, radiating effect); also the per cent. of steam passed and condensed in the returns when a pressure lower than the

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TESTS OF RADIATOR STEAM TRAPS AND VACUUM RETURNS

Square feet of radiation in the returns necessary to cool the water of condensation, or, inversely, the maximum degree of vacuum that can be carried without the use of jet water. The automatic valves are presumed to prevent the passage of steam and the water of condensation is figured at a temperature 10° cooler than the steam from which it is formed. Figured on a 100-sq. ft. radiators at 30 lbs. of condensation per hour.

Vacuum inches.	Temp. steam.	Temp. condens-ation.	Temp. vacuum.	Diff. 30 lbs.	Divided by transmission per sq. ft.	Square feet.
10	212	202	192.23	293.1	250	1.2
15	212	202	179.03	689.1	218	3.16
20	212	202	161.42	1217.4	175	6.97
25	212	202	133.77	2046.9	110	18.6

Per cent. of steam passed when less than the maximum degree of vacuum is maintained by 10% of surface in the return piping.

Vacuum Inches.	B.T.U. from 10 sq. ft.	Less B.T.U. from water	B.T.U. from the steam.	Divide by 970 B.T.U. × 30 equals per cent. steam.
5	2780 (add)	30	2810	9.65
10	2500	293.1	2206.9	7.6
15	2180	689.1	1490.9	5.12
20	1750	1217.4	532.6	1.83

Per cent. of steam passed when less than the maximum degree of vacuum is maintained by 7½% of surface in the return piping.

Vacuum Inches.	B.T.U. from 10 sq. ft.	Less B.T.U. from water.	B.T.U. from the steam.	Divide by 970 B.T.U. × 30 equals per cent. steam.
5	2085 (add)	30	2115	7.27
10	1875	293.1	1581.9	5.43
15	1635	689.1	945.9	3.25

Per cent. of steam passed when less than the maximum degree of vacuum is maintained by 5% of surface in the return piping.

Vacuum Inches.	B.T.U. from 10 sq. ft.	Less B.T.U. from water	B.T.U. from the steam.	Divide by 970 B.T.U. × 30 equals per cent. steam.
5	1390 (add)	30	1420	4.9
10	1250	293.1	956.9	3.29
15	1090	689.1	400.9	1.38

Per cent. of steam passed when less than the maximum degree of vacuum is maintained by 2½% of surface in the return piping.

Vacuum Inches.	B.T.U. from 10 sq. ft.	Less B.T.U. from water	B.T.U. from the steam.	Divide by 970 B.T.U. × 30 equals per cent. steam.
5	695 (add)	30	725	2.49
10	625	293.1	321.9	1.1

Per cent. of steam condensed by 25% of jet water at 50° F.

Vacuum Inches.	Temp. vacuum.	Minus 50 equals B.T.U	B.T.U. by 7.5 lbs.	Divide by 970 B.T.U. × 30 equals per cent. steam.
5	202.92	152.92	1146.9	3.94
10	192.23	142.23	1072	3.69
15	179.03	129.03	967.7	3.38
20	161.42	111.42	835.7	2.88
25	133.77	83.77	628.3	2.17

maximum vacuum is maintained; also the percentage of steam condensed when jet water is used. These figures are based on the assumption that the water of condensation is about 10° cooler than the steam from which it is condensed in cast-iron radiators, as observed by the society's committee on tests last winter.

Canadian Society of Sanitary and Heating Engineers.

A feature of the seventeenth annual convention of the Canadian Society of Sanitary and Heating Engineers, held at Calgary, July 18, was the report of the association's heating and ventilating committee which included a proposed form for a uniform contract. Another matter recommended by the committee was the adoption of a standard formula for figuring heating work. "While it is practically impossible," continued the report, "to devise any formula that will meet with absolute acceptance all over the Dominion, still we think it is possible by getting together and working with the object of getting something good, to evolve a system of figuring radiation, etc., which will meet with favor in all quarters, and, allowing for a reasonable amount of common sense to meet any very exceptional condition, will help in bringing heating down to a scientific basis.

"One of the matters that brought this matter of a uniform method of estimating radiation home to us very strongly, was something that practically every community has to contend with, and that is the coming in to your own particular town of an outsider, who, not being conversant with local conditions in the way of temperature, dampness, high winds, or other causes of raising your standard of figuring above the ordinary accepted rule, figures according to the standard that applies to his own place of business, and generally gets below you through having less radiation.

"He secures the contract, and should at a later period his system fail to give satisfaction, he is not in town to stand the blame, and the whole odium rests on the local firms.

"This is a great question, and one that your committee does not feel themselves competent to handle without further advice, so we place the suggestion before the association to assist us to see some way out of this difficulty.

"A good basis for such a uniform system of figuring would be that of a temperature grading, allowing each district a margin to work on, based on the average temperature in that particular section."

These propositions were endorsed by the resolutions committee.

HEATING ENGINEERS FOR LOCAL BOARDS AND PROVINCIAL HEALTH BOARDS.

Another proposition, brought before the convention by A. C. Waltz, was that an organized effort be made to secure the appointment of at least one or more heating engineers on every school board throughout the Dominion.

"The average school board," he stated, "has no conception whatever of the necessities of furnishing pure air to a room packed full of children, and the architect employed to provide a proper system very often knows no more than the school board as to what the requirements are to properly ventilate a school room.

"Every building constitutes a problem within itself, and can only be solved successfully by those who possess a knowledge of the principle that must be applied and the mechanical skill and experience necessary for a practical application of the work to be done.

"We can, therefore, look for no improvement in our unhealthy school rooms and public places until we elect or appoint a fair representation of men on our boards that have a thorough knowledge and experience to devise a practical system for not only the building to be erected, but to also remodel and place very school room in the Dominion pure.

"An expert ventilating and heating engineer should be made a member of the Provincial Board of Health in every Province. The plans of a heating and ventilating, as well as sanitary system of all public and private schools should be approved by the Provincial board of health before the building is erected. A standard of purity should be fixed, and a rigid enforcement of the standard maintained."

The following officers were elected for the ensuing year: President, E. J. Young, Calgary; vice-president, H. Mahoney, Guelph; secretary-treasurer, J. Marr, Calgary; chairman of heating and ventilating committee, J. Watson, Montreal.

It was voted to hold the 1913 convention in Montreal.

To Reorganize Federal Furnace League.

In accordance with a call issued by Dr. William F. Colbert, secretary and engineer of the Federal Furnace League, a special meeting of furnace manufacturers is being held in Chicago for the purpose of effecting a reorganization of the Federal Furnace League. The call stated that the meeting would be held at the Auditorium Hotel, Chicago, Monday, September 9, at 10 A. M. It is proposed to have the membership include, as heretofore, manufacturers of warm air furnaces and furnace supplies, and to attract the interest, through a reorganization, of many firms not here-

tofore identified with the league. It is thought that in this way the financial resources of the association can be made sufficiently large to carry out the original purposes of the league.

The objects of the new organization are thus enumerated, although they are offered only as suggestions:

To encourage the adoption of suitable standards for the rating of furnaces and suitable standards for the various methods of installation.

To combat legislation adverse to furnace heating.

To secure satisfactory adjustment of freight rates and claims.

To supplement and strengthen the work of the various district associations.

To act as the agent of manufacturers of furnaces and furnace supplies in procuring the publicity necessary to inform the public, architects, and builders of the practical and sanitary advantages of warm air furnace heating.

To act as the agent of manufacturers of furnaces and furnace supplies in any line of co-operative effort the members may authorize.

National Association of Master Plumbers.

Among the resolutions adopted at the recent annual convention of the National Association of Master Plumbers at Salt Lake City, Utah, was one regarding the separation of plumbing and heating contracts from other specifications in Government work. The resolutions committee recommended that the president and secretary of each local association communicate with their respective Congressmen asking them to use their influence with the supervising architect and the constructing quartermasters of the army and navy departments with a view of bringing about such separation of contracts. The resolution was adopted by the convention.

Another resolution proposing a special committee to meet with a similar committee of the National Association of Master Steam and Hot Water Fitters for the discussion of matters of mutual interest was referred to the incoming executive board.

The retiring president, Alfred C. Eynon, proposed in his address that the association establish a trust or surplus treasury fund of $100,000, to be raised by a per capita assessment of $12, payable in yearly installments of $4 each. This proposition was deemed of such importance by the resolutions committee that it recommended the appointment of a special committee of five to develop a plan for raising this money, such plan to be submitted to all State and local associations at least 60 days prior to the next annual convention.

In the matter of settling disputed claims with manufacturers and supply houses, President Eynon recommended that the supply associations be asked to appoint a committee of three, looking to the establishment of an arbitration committee to consider questions of disputed claims. "I realize," he said, "that such a committee would have many complaints that would be without merit and I would guard against this by suggesting that the committee on arbitration promulgate rules under which complaints should be received, as well as the kind of complaints, and to further provide in the rules that the losing party pay the cost of arbitration." The president's recommendations on this subject were adopted by the convention.

President Eynon also cited as the "three unnatural conditions that must be resisted sooner or later," the general contractor, the mail-order plan of sellings goods and the irregular method pursued by some manufacturers and wholesale merchants to dispose of their product contrary to rules accepted as fair, equitable and honorable in commercial trading.

Philadelphia was chosen as the convention city of the association in 1913.

The newly-elected officers are as follows: President, Frank J. Fee, New York; vice-president, Chris. Irving, Denver, Colo.; treasurer, William McCoach, Philadelphia; for secretary the new president appointed Charles Murphy, New York.

Contractors Form Mutual Liability Insurance Company.

At the recent annual convention of the master plumbers, President Alfred C. Enyon described the formation and operation of the new mutual liability insurance company by the master plumbers of Milwaukee, for the purpose of mutually insuring each other against the liability for compensation to employees for their disablement or death by accident. In its essential features the scheme followed in Milwaukee would serve as a pattern for similar organizations in other trades and in other States having employers' liability laws.

The organization is known as the Master Plumbers' Limited Mutual Liability Insurance Company of Milwaukee. Only master plumbers affiliated with the Milwaukee Master Plumbers' Association are eligible to membership. The plan is to charge 1 per cent. premium on the estimated amount of business and, to reimburse himself, each member charges an additional 1 per cent. on all work performed, thus making the premium part of the "overhead expenses." This step was taken largely on account of the excessive premiums of the regular lia-

bility insurance companies since the Wisconsin Workmen's Compensation Act went into effect. It is stated that over two-thirds of the membership of the Milwaukee association are policyholders.

The policy is of the standard form and insure the holder "against loss and expenses resulting from claims made upon the assured" (the master plumber) "for damages on account of bodily injuries, including death, suffered through an accident occurring during the term of this policy by any employee or employees of the assured, or by any person or persons not employed by the assured, in and during the work of general plumbing, steam and gas-fitting, and all work pertaining thereto, including the use of one or more teams or vehicles in the business of the assured (the word 'vehicles' to include automobiles when used for delivery purposes and in connection with said business)."

The company's payment for an accident resulting in injuries to, or death of, one employee is limited to $3,000; and the company's total liability of an accident resulting in injuries to, or death of, several employees is $6,000. The company's liability for injuries or death of one person not employed by the master plumber is limited to $5,000, and the cost of injury or death of two or more persons not employed by the master plumber is limited to $10,000.

Building Costs for a Modern Skyscraper.

The following building costs for a modern first-class office building are contained in a paper read by J. A. Strouss. of Knox, Strouss & Bragdon, Pittsburg, before the Manufacturers' and Contractors' Club, of Pittsburg. The total cost of the building, as will be seen, was $1,270,421, divided as follows:

Wrecking	$ 4,158	.33
Excavating	47,990	3.79
Shoring	34,876	2.74
Steel work	156,563	12.33
Stone, cement and concrete	95,525	7.52
Fireproofing	38,865	3.07
Brick work	56,222	4.44
Plastering	39,560	3.11
Painting	20,335	1.60
Mill work	86,100	6.77
Carpenter work	117,000	9.22
Terra cotta	40,000	3.15
Heating	75.330	5.93
Elevators	106,200	8.36
Electric work	40,500	3.17
Sheet metal	21,840	1.72
Plumbing	51,520	4.06
Waterproofing	9,500	.75
Metal lathing	9,100	.71
Ornamental iron	75,900	5.98
Tile and marble	90,000	7.09
Weatherstripping	1.025	.08
Vaults	24,750	1.94
Hardware	1,500	.12
Vacuum systems	5,000	.36
Mail chute	2,250	.18
Revolving doors, etc.	5,700	.45
Steel lockers	8,335	.66
Refrigerating machinery	3,827	.30
Roofing	950	.07
	$1,270,521	100.00

"The list is interesting," comments the author, "as shedding light on the question as to whether a mason or a carpenter is a logical man for a general contractor on work of this type, as it is generally considered by most of us that the trade having the largest interest in the proposed structure is in the best shape to take the general contract.

"It is also of interest as showing one of the reasons for the elimination of the general contractor and the subletting of work direct by the owner through the architect.

"The writer will confess to being astonished at the cost of the equipment, as most of us would hardly consider it true that almost one-fourth of the total cost of the building goes into the various auxiliary devices which are now considered necessary to make an office building habitable."

Refrigeration for Apartment Houses.

A method used for supplying refrigeration in an apartment from a central plant in the basement is illustrated in the accompanying drawing of a typical installation. It will be noted that four apartment house refrigerators are located directly above each other on the four floors, these boxes being cooled by the circulation of cold brine. This brine is taken from the tank which is located in the basement, by means of a circulating pump and circulated through risers to the different boxes on the floors above, each box having separate connections with regulating valves, so that the same can be cut in and out of service, the brine after passing through the coils returning direct to the tank.

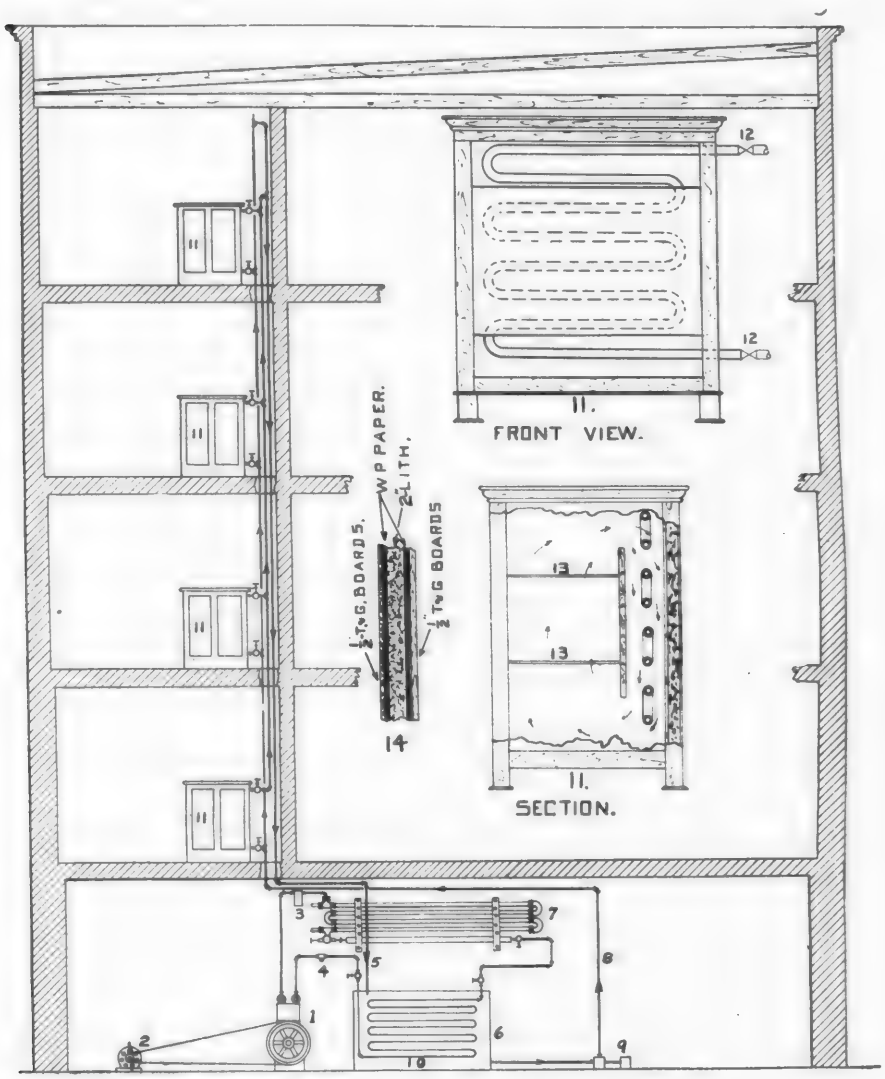
Usually the ammonia compressor is operated by an electric motor, and in the brine tank there is placed a certain amount of direct expansion ammonia coils which are used for cooling the brine. The liquid ammonia is allowed to enter these coils through an expansion valve, this valve being similar to a needle valve.

The pressure in the expansion coils is usually kept at about 15 lbs. The liquid ammonia expands in these coils and is taken by the compressor and compressed into the ammonia condenser. The ammonia condenser as shown is of the double pipe pattern and made of 2-in. and 1¼-in. pipe.

The cooling water which is used for reliquefying the ammonia gas passes through the 1¼-in. pipe of the condenser, and the ammonia gas coming from the compressor at a pressure of about 150 to 170 lbs. travels between the 1¼-in. pipe and the 2-in. pipe. The effect of the cooling water, and

the pressure that is on the gas causes this gas to liquefy and return into a liquid receiver which is placed at the bottom of the condenser. From this liquid receiver the ammonia liquid passes to the expansion valve again and is allowed to expand from

hours in the morning, and the same at night, and, while the refrigerating machine is shut down, the brine pump can be kept in operation circulating the cold brine from the tank through the boxes. In this way a steady temperature is assured in all of



1-COMPRESSOR.
2-MOTOR.
3-OIL TRAP.
4-SCALE TRAP.
5-BRINE RETURN.
6-BRINE TANK.
7-AMMONIA CONDENSER.
8-BRINE FEED TO BOXES.
9-BRINE PUMP.
10-DIRECT EXPANSION COIL.
11-REFRIGERATORS.
12 VALVES.
13 GALV. WIRE SHELVES.
14 DETAIL OF INSULATION.

REFRIGERATING PLANT FOR APARTMENTS AND RESIDENCES.

liquid into gas, at which time it cools the brine and is taken by the compressor again and forced into the ammonia condenser. This is similar to the action of ammonia in a refrigerating plant.

With this construction the refrigerating machine can be operated two or three

the boxes without the refrigeration machine being kept continually in operation.

The system eliminates installing any brine tanks in the refrigerators. All that is necessary are the brine coils which are shown in the sectional view. Usually these

refrigerators are fitted with a drinking water cooling arrangement, and all that is necessary for this is a continuous water coil which will hold a certain amount of water in the refrigerator, and in this way ice cold drinking water can be obtained at all times.

Another feature of this system is that the ammonia pipes are not run all over the building, but are kept as close together as possible in the basement, and the pipes that are run through the building are merely used for the circulating of the brine. The capacity of the machine required for an apartment house is governed by the number of refrigerators that are to be cooled, and the size of the same. Another feature that can be added to this system is an ice making apparatus. To add this to the plant all that is necessary is to place the ice making cans in the brine tank in the basement, and in this way a certain amount of ice can be manufactured, if desired.

We are indebted to the Baker Ice Machine Co., of Omaha, Neb., for the details here given.

Consolidation oi Two Large Companies.

One of the largest steam specialty manufacturing concerns in the country is the result of the formation of the Griscom-Russell Company, with a capital of $2,000,000, by the consolidation of the Griscom-Spencer Co. of New York and Jersey City, and the Russell Engine Company of Massillon, O. The general offices will be at 90 West Street, New York.

C. A. Griscom, Jr., president of the Griscom-Spencer Co., becomes president of the new company. The Russell Engine Company interests will be represented by its former treasurer and general manager, Arvine Wales, first vice-president of the consolidation, while C. M. Russell, vice-president, joins the Board of Directors. The staffs of the two companies remain, but the selling and agency organizations will be increased. The Jersey City plant of the former company will gradually be moved to Massillon. As soon as the exact requirements have been determined, a 700 ft. x 150 ft. brick shop will be erected.

The growth of the Griscom-Spencer Co., formerly the James Reilly Repair and Supply Co., had long necessitated larger quarters. The new company will manufacture a complete line of specialties, including the Reilly multicoil feed water heater (closed type), Goubert multipass feed water heater, Goubert hot water generator, Goubert steam condenser, Massillon feed water heaters (open type), Stratton steam separator, Bundy steam and oil separators, Thompson evaporative steam condenser, "G-R" water filters, "G-R" grease extractors, "G-R" coolers and heat extractors, "G-R" air conditioning devices, and the Russell steam engines.

Measuring Emulsified Oil in Condensate

It is ordinarily not difficult to detect the presence of free oil in water, since, given sufficient time, the oil will make its appearance on the surface. It is not always so easy, however, to detect emulsified oil, which is nearly always present in the condensed exhausts from reciprocating engines, pumps and other apparatus where a good oil separator is not installed in the exhaust steam line. Formerly, it was customary to dissolve grease out of surface condensers, closed heaters, heating coils, etc., by means of a strong solution of caustic soda, caustic potash, or lye, but as modern cylinder lubricants are composed chiefly of mineral oils, this can no longer be done, as mineral oils are not saponified or otherwise affected by alkaline bases. The modern theory regarding emulsified

DEVICE FOR MEASURING EMULSIFIED OIL IN CONDENSATE.

oil in water, which gives it a bluish, opalescent or milky appearance, is that it is made up of minute particles of oil in suspension, each particle carrying an electrical charge that prevents coalescence of the separate particles.

An instrument for detecting oily emulsion, illustrated herewith, is known as the Martin test tube, and is sold in the United States by the Harrison Safety Boiler Works, 3189 No. 17th St., Philadelphia, Pa., manufacturer of the Cochrane open feed water heaters, steam and oil separators, and the Sorge-Cochrane hot process water softening systems. This instrument is in reality a long test tube, made of clear glass, except at the bottom, which is opalescent or milky. It also has a small black dot in the centre of the bottom of the tube. The manner of using the instrument is to collect in a glass or cup a sample of the condensate to be tested. The tube is then taken to a good light from a northern exposure, that is, neither direct sunlight nor electric light. The water is poured slowly into the tube until the black dot just disappears from view. The graduation on the tube which is then opposite the level of the water in the tube will show the amount of oil in emulsion, in grains per U. S. gallon. The tube belongs to the class of instruments known as "turbidometers" and when used with proper precautions, is said to give very accurate results. It has proved useful in ferreting out the sources of oil in boiler feed supplies, in testing the efficiency of different types of oil separators and in determining the degree to which different grades of cylinder oil will emulsify.

A New Air Meter.

In estimating compressed and free air and fixed gases the practice of taking half the quantity and multiplying it by the cube root of eight would not be satisfactory now to the commercial superintendent or engineer because there are better methods of getting the facts. Fairly accurate results are obtained of the volume or weight of air or gas flowing through a pipe by multiplying the cross section by the average velocity obtained by the formula $V\sqrt{2gh}$. In this formula it is essential to get the head very accurately to insure correct results.

On account of the meniscus of a liquid in a glass tube changing its condition the ordinary head cannot be read much closer than 1/10-in. in a vertical tube.

In order to get closer readings and consequently more accurate determination the Pitot meter for measuring air or gas, shown herewith, has been brought out by the Sargent Steam Meter Co., Chicago, Ill. It can be attached to any pipe from ½-in. up, and on account of its light weight can be used for a portable as well as a permanent meter.

The meter consists of a brass tube or well, around the circumference of which is spun a semi-circular groove in which is wound a transparent celluloid tube, the lower end of which connects to the well and the upper end to a passage through the yoke and cock to the tube in pipe whose opening is perpendicular to the flow of gas or air.

The well is connected by a similar opening through the yoke and cock to the Pitot tube having one or more openings facing the flow of the air or gas.

Water or oil is put into the well through an opening made for the purpose until it reaches a zero mark on the helix. Then the cock handle is vertical the space above the fluid in the well and above the fluid in the helix are both open to the atmosphere. If the fluid stands

NEW TYPE OF AIR AND GAS METER.

at zero under these conditions, accurate results will be obtained.

By turning the cock handle 90°, as shown in cut, the well is connected with the air or gas pipe through the Pitot tube and the space in the helix is connected to the same pipe through the straight tube.

If there is no velocity to the air or gas in the pipe, the liquid in the helix will still remain at zero irrespective of the pressure. In other words, the static head does not change with the pressure where the Pitot tubes terminate.

The pressure in the Pitot tube when the air or gas flows through the pipe is transmitted to the well, and the liquid in the helix rises in proportion to the velocity of the air or gas.

For every inch of vertical rise the liquid travels about 10 in. around the well, and, as this distance is graduated in 100 parts, the head can be read to 1/100 of an inch, consequently the actual velocity of the air of gas is readily determined.

The well and helix are revolvable on the yoke so that the head of liquid in the helix can always be read, yet the connection to the pipe is not broken.

Any error caused by evaporation or condensation is readily detected by turning the cock handle for an instant to a vertical position, when the liquid in helix should return to zero if conditions have not changed.

As the helical tube is of transparent celluloid it cannot break. Meters are tested to 100 lbs. pressure.

Improved Superheater Design.

For many years there has been a demand for a superheater in connection with the generation of steam which would give a close regulation of superheat, because economy is sacrificed if the superheat drops to a low figure and troubles occur if the superheat rises to too high a temperature and since it has been found that fluctuations in steam temperature cause rupture of cast-iron fittings. An apparatus designed to meet this demand for close regulation and containing other interesting features of design, including the absence of necessity for flooding, is shown in the accompanying illustrations of the Heine superheater, used in connection with the Heine water-tube boiler, made by the Heine Safety Boiler Co., St. Louis, Mo.

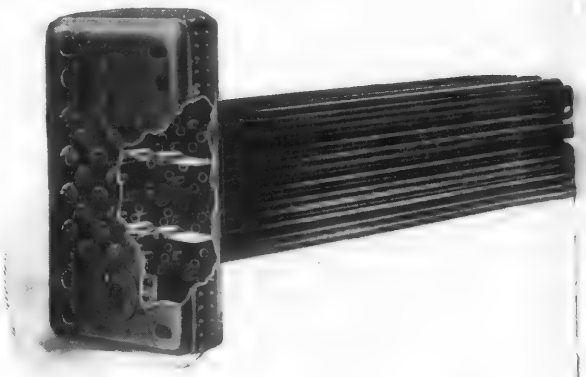


FIG. 2—THE HEINE SUPERHEATER SHOWING HEADER CONSTRUCTION AND DIAPHRAGMS DIRECTING THE STEAM THROUGH THE TUBES IN FOUR PASSES.

It is now generally recognized that the highest commercial efficiency, everything considered, is secured by the use of moderate superheat, say from 125° to 150° F. in turbine plants, and the same or somewhat lower superheat in reciprocating engine plants where a low superheat eliminates losses from moisture and reduces cylinder condensation without causing lubricating troubles. The temperature at which steam will be superheated depends upon the amount of steam flowing through the superheater tubes and its temperature, and, secondly, upon the amount of gas flowing over the tubes and its temperature. As the quantity of steam is controlled by the boiler load, the temperature of steam will be determined by the amount and temperature of the hot gases, which will in turn depend on the design and arrangement of boiler and superheater.

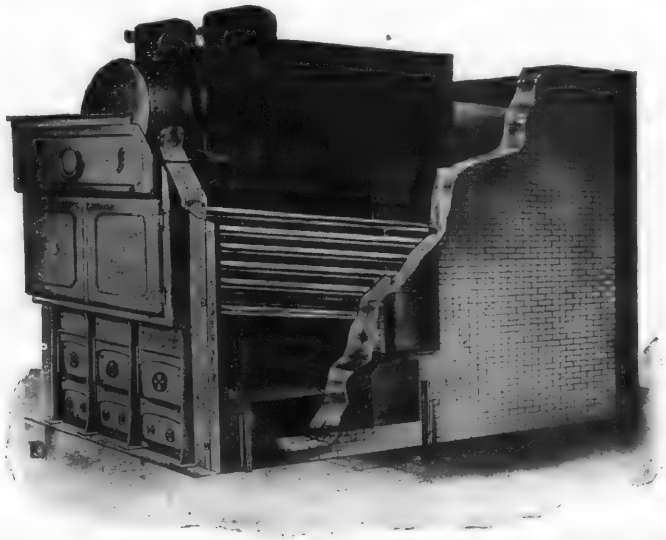


FIG. 1—ARRANGEMENT OF HEINE BOILER AND SUPERHEATER.

The Heine superheater is built on the principle that in order to secure constant superheat, it is necessary to control the volume of gases which pass over the superheater surface. The superheater itself is shown in Fig. 1 and consists of a header box in one side of which are inserted U tubes made of 1½-in. seamless drawn mild steel tubing, expanded into holes provided for them. Hollow stay bolts are used in the header and provide means for introducing a soot blower in order to keep the exterior surfaces of the superheater tubes free from soot. The header box is divided into three compartments, so that the steam makes four passes in passing through the tube surface.

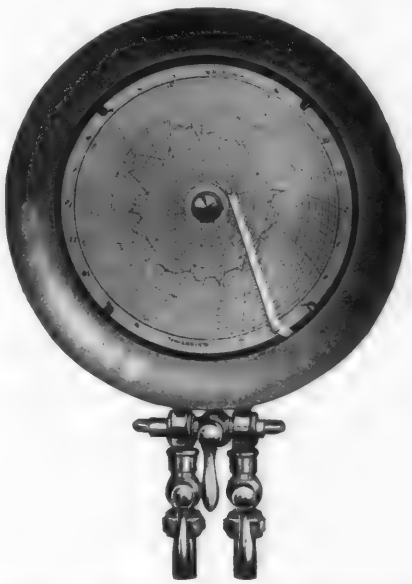
The superheater is located at the side of the shell towards the front of the boiler (Fig. 2) and a small flue built in the side walls of the setting carries hot gases from the furnace into the superheater chamber. The gases passing up through this flue come into contact with only a small part of the boiler surface and then enter the superheater chamber, making two passes over the superheating surface. With this arrangement, the temperature of the gases entering the superheater will approximate 1,500° F. The average gas temperature is thus 1,000° F. and with an average steam temperature of 425°, the difference in temperature is 575°. This difference, it is stated, is considerably higher than that obtained where the superheater is installed in the path of the boiler gases.

In several respects, this design is similar to an independently fired superheater, but without being affected by the rate of combustion, because a damper in the outlet of the superheater setting controls the volume of hot gases used and can shut off the flow of combustion gases entirely when no superheat is desired or when the load goes off. This damper may be regulated by hand from the front of the boiler or automatically. It has been found possible, with this arrangement, to control the temperature of the superheat to within 5° of any desired figure.

A New Differential Recording Gauge

The accompanying illustration shows a new differential recording gauge which has been placed on the market by The Industrial Instrument Co., Foxboro, Mass., showing the values for admission of pressures, the difference between which is to be recorded. The moving element consists of a patented pressure tube movement as used in Foxboro designs of improved pressure recorders. For ranges below 10 lbs. per square inch, a diaphragm tube is employed, and for differential pressure exceeding 10 lbs. per square inch the helical tube movement is used. In both the pen arm is directly attached to a shaft giving a substantial support and rigidity to the movement. A friction joint is supplied in the pen arm, *in line of the shaft,* making adjustment possible, where necessary and without affecting the length of the pen arm.

A pressure tube of the required range to cover the differential pressure desired is employed; one of the two pressures the difference between which is to be recorded, is applied internally to the pressure tube and the other is applied externally. The



NEW TYPE OF DIFFERENTIAL RECORDING GAUGE.

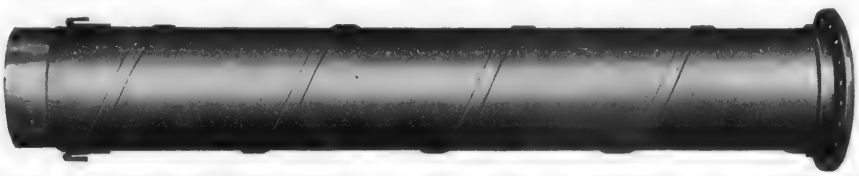
principle being the same as in ordinary practice with the difference that one pressure instead of being atmosphere is replaced by some other pressure.

Transmission from the movement to the pen arm is obtained through a special bearing through the wall of the chamber enclosing the movement. It will be seen that there is practically no limit to the range of the difference or static pressure under which this recorder can be used. It is especially adapted to measure the flow of fluids by means of Venturi or Pitot tubes. One interesting and very useful application is for recording the height of water in a boiler. Applied to the water column, the recorder gives a record not only of the height of water, but an accurate record of the time the water column or gauge glass is blown, the time and amount the boiler is blown off, and any other disturbances affecting the height of water in the gauge glass. The continuous record will induce uniform condition of water level and be an efficient check against unsafe high or low water, insuring greater economy and safety. Disputes frequently arise when there is any trouble with water in cylinders. This recorder will show conclusively

whether trouble is due to high water or must be looked for elsewhere. The recorder may be placed at a distance from the boiler and in case of boiler explosion place responsibility where it belongs.

New Type of Reinforced Spiral Pipe

A reinforced spiral pipe, with a continuous interlocking band wound spirally on the outside of the pipe, is a new product of the Standard Spiral Pipe Works, No. 25 Dearborn St., Chicago. The pipe is smooth on the inside and all flanges and other connections at the end are welded to the pipe. It is claimed to be as strong as any other riveted pipe of the same gauge and bursting tests have shown 90% over-efficiency in the interlocking seam.



STANDARD REIOFORCED SPIRAL PIPE, WITH CONTINUOUS INTERLOCKING SEAM.

In detail the pipe is made of two strips of steel of different widths, and having, as stated, a continuous interlocking seam.

Both strips of steel are rolled to shape on the edges and are interlocked and rolled down under very high pressure in a special machine which this company has patented. The strips of steel are first cut to the required width from long sheets of steel and the ends are welded together. The steel is then placed on large spools. The strip used for the outside or the reinforcing band comes from the steel mills in long lengths on reels. Both of these strips are fed into the machine at one end, rolled down and interlocked in the machine, coming out at the other end in the shape of pipe.

SECTION OF STANDARD REINFORCED SPIRAL PIPE SHOWING SMOOTH INSIDE.

The reinforcing band runs on the outside the entire length of the piece, and the pipe can be made endless. This strip is not welded or soldered on to the pipe but is inter-locked in the form of a continuous seam. Ample folds are made on both strips so that a large bearing surface or contact is obtained at the seam. The advantage of this reinforcing band and smooth inside can readily be seen by engineers and others who have met with frictional resistances in riveted pipes.

A soft open hearth steel is used which will stand the required bending.

It will be noticed that in the construction of Standard reinforced spiral pipe there are no rivet heads protruding on the inside; the pipe is smooth on the inside and therefore has the least possible frictional resistance to flow of water or other substances.

A number of bursting tests have been made on this pipe. In connection with one test at the Armour Institute with a piece of 18-in. No. 20 reinforced galvanized spiral pipe, it required 235 lbs. hydraulic pressure to burst the seam. Other features mentioned by the manufacturers of this style of pipe are the method of construction to prevent leakage and the comparative lightness of the piping.

Standard reinforced spiral pipe is supplied galvanized in any required length up to 20 ft., and asphalted in any required length up to 25 ft.

Engineering Review Sold.

Announcement is made that the *Engineering Review,* of New York, published monthly in the interests of the heating, ventilating, plumbing, metal working and lighting trades, has been merged with the *Metal Worker,* of New York. The change becomes effective with the October, 1912, issue. The *Metal Worker,* which is a weekly publication, will increase the number of its reading pages, beginning with the issue of October 4, to include the field covered by *Engineering Review.* E. A. Scott remains managing editor of the *Metal Worker;* Frank K. Chew, editor and W. W. Macon, consulting editor.

Trade Literature.

Nonpareil High Pressure Coverings for high pressure and superheated steam lines, boilers, breechings and all heated surfaces, is the title of an unusually full and interesting treatise on the subject of heat insultation in general and with special reference to the Nonpareil high pressure coverings, made by the Armstrong Cork Co., Pittsburg, Pa. This company enjoys the reputation of being one of the largest manufacturers of cork in the world. Some ten years

ago the company branched out into the cold storage insulation field, utilizing its waste cork for the manufacture of Nonpareil corkboard insulation and Nonpareil cork covering for brine, ammonia and ice water lines. About a year ago, in order to distribute its insulating materials to greater advantage, the company decided to add to its line a new type of high pressure and superheated steam pipe and boiler covering.

This material, known as Nonpareil high pressure covering, contains no cork, but consists of diatomaceous earth and asbestos fibre. Diatomaceous earth, sometimes called infusorial earth, is a peculiar substance of very low specific gravity. It is made up of the skeletons or shells of microscopic plants known as diatoms, which existed in the sea bottoms ages ago. These minute bodies, which are practically pure silica, can be seen under the microscope in many different forms. So small are they, that there are literally billions of them to the cubic inch. All are hollow and contain air. Diatomaceous earth has thus been found to be an excellent nonconductor of heat.

In the form of plastic cement it has been used for years in Europe for heat insulating purposes. However, the Armstrong company states that until it discovered the process which it is now using, no satisfactory method was available by which it could be bonded together in sectional form so as to produce a strong, efficient pipe covering for high pressure work.

Nonpareil covering has a number of advantages as a high pressure covering. For instance, it is claimed by the makers that this material is from 10% to 15% more efficient as a non-conductor of heat, and, in the company's catalogue, a number of tests, made by several well-known authorities, are given to support this claim. The material has also been found not to calcine and disintegrate under high temperatures, thus making it well suited for the insulation of superheated steam lines, breechings, etc. The point, however, which would probably appeal most strongly to the majority of users is that this covering is found to be unaffected by moisture or steam. Sections of it have been submerged in water for weeks and, after being taken out and dried, were found to be quite as strong and efficient as before. The covering is easy to apply and the price, it is understood, compares favorably with that of other high pressure coverings.

Nonpareil high pressure covering is made in sectional, block and cement form. The sections are 36 inches in length and are furnished for all pipes of standard size up to 14 inches. For pipes of larger diameter, boilers, breechings, etc., Nonpareil high pressure blocks are used, while for insulating fittings and irregular surfaces, Nonpareil high pressure cement is furnished.

In addition to the tests described, the treatise contains many photographs of the covering by itself and as installed. Price lists are also included. Size 5x7½ in. pp. 72. All users of steam, we understand, are invited to write for catalogue, samples and prices.

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THE SILENT FLOAT CHAMBER IN THE MONASH RADIFIER

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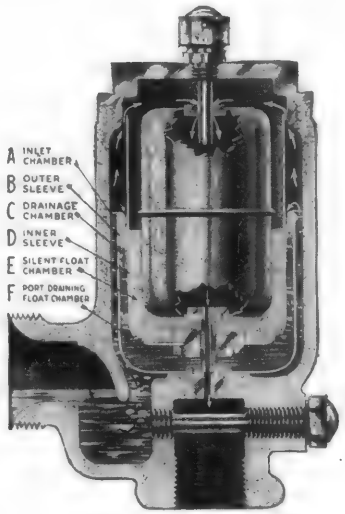

In the MONASH NOISELESS RADIFIER the float and drainage chamber are separate, each to perform its individual function. In the drainage chamber (C) drainage into the return is direct, rapid and absolute. In the silent chamber (E) the body of water is always still with a slight and gradual lowering of the line of flotation—thereby insuring silence in action of the motor float.

ATTENTION—To Heating Engineers who are interested in specifying Vacuum Heating Systems and who will write us on their letterhead, we will send our ***Book of Blue Prints*** showing typical installations for MONASH NOISELESS SYSTEM of Vacuum Heating. The information contained in this book has never before been published. Write at once as the edition is limited.

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TRADE AND MISCELLANEOUS NOTES

Deaths.

Frank J. Mulcahy, vice-president and general manager of the Crane Valve Co., Bridgeport, Conn., died at Bridgeport, August 10, following an operation for appendicitis. He was 53 years old.

Miscellaneous Notes.

Baltimore, Md.—The Board of Estimate has voted down the proposition to heat and light the city hall and court house next winter from the high-pressure pipe-line pumping station on South St. It was proposed by this plan to effect a saving of $20,000 a year. The opinion was expressed that the use of power from the pumping station for other than fire control would prevent the National Board of Fire Underwriters from considering a reduction in fire insurance rates. An appropriation of about $22,000 for a new boiler at the pumping station will be made in the tax levy budget, so that it is probable that the plan will be revived next year.

Anderson, Ind.—Work is progressing satisfactorily on the new steam heating plant of the Central Heating Co. The foundations, which are now completed, rise to a height of 15 ft. on account of the high waters which annually flood the bottom land where the new plant is located.

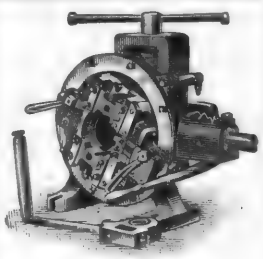
Springfield, Ill.—The Board of Education has rescinded its contract with the Somerland Heat & Power Co., of St. Louis, for the heating and ventilation of the high school building and has awarded the contract to the R. Hass Electric Co., of Springfield, at its bid of $19,800. The trouble arose over the refusal of the Springfield Federation to co-operate with the St. Louis firm's steam fitters, who are not affiliated with the Illinois Federation. It is probable the work will be held up in litigation proceedings.

Rossville, Ill.—A central heating plant which will heat the greater part of the business houses of Rossville is under consideration, a franchise for that purpose having recently been granted by the town council to F. L. Stewart, acting for a number of local business men. It is proposed to utilize the old electric light plant as the town now gets its light from Hoopeston.

Decatur, Ill.—To determine by temperature tests the efficiency of car insulation, two committees of experts representing the United States Post Office Department and the railroads, recently conducted an experiment on three cars attached to a Vandalia train between Indianapolis and St. Louis. The tests were made on all-steel mail car of the Pennsylvania line, a modern steel car of the New York Central line and a wooden mail car. The government's experiments are being carried on with a view of adopting a standard type of mail car.

Toledo, O.—Plans for the establishment of a new industry in Toledo to manufacture hot water heaters of a new type are under way. The new Company will operate on patents owned by J. Frank Hickerson, of McComb. A number of the new type of heaters were built during the past winter and are said to have worked satisfactorily.

Battle Creek, Mich.—Arrangements have been completed whereby the Battle Creek Light & Power Co., a subsidiary company of the Commonwealth Power Co., will build a lighting and



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From 1 Inch to 4 Inches

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Manufactured by

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BRIDGEPORT, CONN.

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heating plant on Jackson St., at the rear of the American Hotel. It is planned to supply exhaust steam heat to all of the C. W. Post buildings, including the theatre, tavern, the Post Block, the Marjorie Block and Enquirer Building. The new plant will be completed by Feb. 1, 1913.

Milwaukee, Wis.—The proposition to build a central heating plant at Wauwatosa to heat the county institutions at that place, was discussed at a recent meeting of the county board committee. Such a plant it is estimated, will cost about $500,000. A lengthy report has been made on the subject by James McAlear, consulting engineer, of Chicago. Mr. McAlear in his report estimates that the saving effected by such a plant would be $32,000 over the present expense, which would enable the plant to pay for itself in less than a dozen years. The cost of running the individual plants of the country institutions now amounts to $76,579.98 a year, or will when the new agricultural school is finished. The cost of running a central heating plant would be $45,100, according to the report, the labor costing $13,580 a year, the coal $29,520 and the upkeep of the plant $2.000. The details of the estimate for the central heating plant include $98,000 for a two-story building; $193,400 for tunnels, $122,500 for a boiler room, $27,000 for water works; $20,000 for connections with the present mains; $9,600 for a spur track 2100 ft. long and $23,500 for an engineer. From the total must be deducted, says the report, $139,691.30 which the county will have to spend for improvements on its present individual plants. The report advises that the plant be built north of the Watertown plank road and west of the present county fire station. The proposed plant would require boilers of 2100 H. P. and electric current generators of 500 K. W. capacity. All details of the building plans are fully outlined in the report, the power plant itself being designed to occupy 101.9x 155.11 ft., two stories high, of brick and stone.

Vigorous objection to the proposed scheme has been expressed by Thomas J. Neacy, who asserts that it would be more profitable for the county to maintain and improve the individual plants for the various institutions, inasmuch as they are already in existence. The installation of a central plant, he stated, would mean the destruction of the existing plants, which are valued at $100,000. According to Mr. Neacy's estimates, the proposed investment would result as follows:

Engineer's estimate		$494,000
Contingency against "extras" 10 per cent.		49,400
Destruction of existing plants, loss to the county		100,000
Interest on bonds of $500,000, 4½ per cent		225,000
		$869,000
Less upkeep of existing plants	$10,000	
Power plant for the farm school	15,000	
		25,000
		$844,000
Less saving on "paper" claimed for central plant		250,000
Dead loss to county		$594,000

Newark, N. J.—A $30,000 central heating plant for the City Hospital, the proposed nurses, home, garage and laundry is being planned by Harry and John King, the architects. Although no definite action has been taken by the committee, it is thought probable that the architects' plans will be

INDUSTRIAL INSTRUMENTS

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adopted. Alderman Fischer is the chairman of the building committee. The architects found that the present heating plant in the hospital will be hardly large enough to supply the hospital when the sun parlors and fire escapes are added on both the north and south sides. It was also found to be cheaper to have a central plant than separate ones in the hospital proper, the nurses' home and the garage and laundry. The total cost of the proposed alterations to the City Hospital are estimated at $350,000.

Waterloo, Ia.—Central Heating Co., has been incorporated, with a capital stock of $25,000, in connection with the improvements to be made by the James Black Dry Goods Co. A heating plant will be built at East Fourth Street and Sycamore St., which will supply heat to the entire block bounded by Sycamore, Fourth, Lafayette Sts, and Park Ave. The company which has been formed to build the plant is composed of H. C. Martin, the James Black Co. and George E. Lichty.

Des Moines, Ia.—Permission has been granted by the city council to F. C., G. C. and F. M. Hubbell to lay heating mains across Walnut St. at Ninth, so that the two buildings at Ninth and Walnut Sts. may be heated from one plant. The Hubbells has incorporated for this work as the Des Moines Plumbing Co.

Cleveland, O.—Heating rates for heat supplied from the city's new central heating plant at the Fairmount Pumping Station will be 30c. per 1000 lbs. of steam used. For buildings having 20,000 sq. ft. or over, the rate will be 25c. The city, it is stated, will make the 25c. rate general when the business at its plant increases sufficiently.

Springfield, Ill.—The Springfield Utilities Co. has closed a forty-year lease with Edward W. Payne for a tract of land fronting west on Third St., between Monroe and Adams Sts., on which it will build a supplemental heating plant, to cost $35,000, to be used in connection with its present plant. The equipment will include two 350 H. P. water tube boilers, for which the order has been placed.

Ithaca, N. Y.—Ground has been broken for the new central heating plant at the State College of Agriculture which will be used to heat the two new additions, the Home Economics and Poultry Husbandry buildings during the coming winter.

New Firms and Business Changes.

C. W. Johnson, Inc., has opened offices at 644 West Jackson Boulevard, Chicago, as engineers and contractors for heating, power piping and ventilating work. Mr. Johnson was formerly connected with Robert Gordon, heating and power piping contractor. Associated with him in the new company are F. E. Firestein and G. A. Johnson.

Manufacturers' Notes.

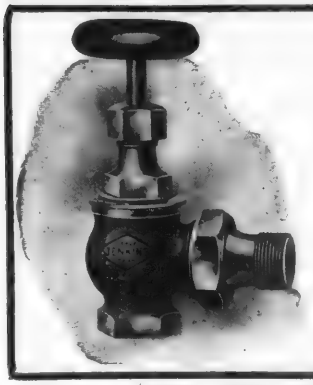
C. A. Dunham Co., Marshalltown, Ia., manufacturers of the Dunham system of steam heating announces the appointment of Frederick D. B. Ingalls as its heating and ventilating engineer. Mr. Ingalls was formerly engaged in consulting engineering work in Syracuse,

Hart Mfg. Co., Cleveland, O., manufacturer of pipe threading machines, etc., will build a new plant on East Twentieth St., Cleveland, which will double its present capacity. The new building will be 150x250 ft., two stories, of reinforced concrete construction.

Abendroth Bros., Portchester, N. Y., announces the engagement of L. Moore as manager of the company's boiler department. Mr. Moore was formerly identified with this company in the same position and his return is the occasion for congratulations from his many friends in the heating trade.

Pierce, Butler & Pierce Mfg. Co., Syracuse, N. Y., announces the removal of its Boston office and boiler and radiator show rooms to Federal and Franklin Streets.

Utica Heater Co., Utica, N. Y., has elected Frank T. Bassett, Jr., as secretary of the company. Mr. Bassett was formerly eastern sales manager for the International Heater Co.



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Alberger Pump & Condenser Co., New York, will build a two-story and basement addition to its plant at Newburg, N. Y., with dimensions of 60x 150 ft.

American Steam Pump Co., Battle Creek, Mich., announces that James M. Stannard, Vice-President and general manager of the Scott Valve Co., Chicago, has resigned his connection with that company and has become the Chicago manager for the American Steam Pump Co., with offices at 1220-1221 Monadnock Block. This company's products have been handled by the Scott Valve Co. for many years.

New Incorporations.

Vesta Mfg. Co., Rutherford, N. J., capital $10,000, to manufacture hot water heaters, hardware, etc. Incorporators—Edward A. Brown, S. C. S. Cohen and Samuel Ginsberg.

Crawfordsville Plumbing Co., Crawfordsville, Ind., capital $10,000, to conduct a heating and plumbing business. Directors—J. N. Dickerson, Lew Wade and Walter Kelly.

Keystone Plumbing Co., Dover, Del., capital, $10,000, to conduct a heating plumbing and gas-fitting business.

Selb-Hutton Plumbing Co., Spokane, Wash., organized to conduct a contracting and jobbing business in heating and plumbing supplies.

Dayton & Montgomery, Inc., Brooklyn, N. Y., capital $10,000, to engage in heating and plumbing work. Directors—Ralph E. Dayton, Mabel B. Dayton and Harry M. Clark, all of Brooklyn.

Kohne Bros. Co., Pittsburg, Pa., capital $10,000, to conduct a heating and plumbing business. Incorporators—C. C. Kohne, H. F. Kohne and A. R. Moody.

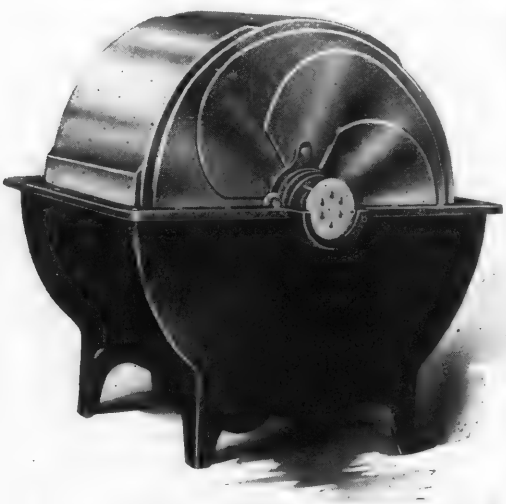
E. L. Stallings Co., Spartanburg, S. C., capital $10,000, to carry on a heating and plumbing business. Incorporators—E. L. Stallings and Otto Zabel.

American Plumbing & Heating Co., Plainfield, N. J., capital $60,000, to engage in heating and plumbing work. Incorporators—Arthur H. White, T. Judson Van Wagner and Samuel T. Williams.

Los Angeles Vacuum Gas Heating Co., Los Angeles, Cal., capital $150,000, to promote the Rector system of gas heating.

Oregon Heating & Plumbing Co., Oregon, Mo., Manager, Herbert McDonald, formerly with the Bragg-Munn Hardware Co.

G. H. Arndt Co., Cleveland, O., capital $10,000, to conduct a heating, plumbing and gas-fitting business. Incorpora-



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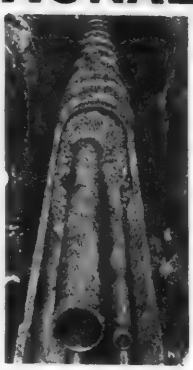


This is a conduit made in 3-foot sections, salt-glazed inside and out. It is absolutely watertight.

Acids, gases or the action of the earth do not affect it. Neither can it be injured by weight or movement of pipes. Practically indestructible.

Easily opened after installation. Can even be taken up and relaid. The most efficient conduit for conveying steam, gas, water, brine or other liquids underground.

Saves 90% of heat lost in transmission through unprotected or poorly insulated pipes.

Write for Catalog No. 112

H. W. JOHNS-MANVILLE CO.

Albany	Detroit	New York
Baltimore	Indianapolis	Omaha
Boston	Kansas City	Philadelphia
Buffalo	Los Angeles	Pittsburgh
Chicago	Louisville	San Francisco
Cincinnati	Milwaukee	Seattle
Cleveland	Minneapolis	St. Louis
Dallas	New Orleans	Syracuse

[1384]

tors—G. H. Arndt, Amanda Arndt, E. F. Umlant, F. R. Arend and Alfred A. Cartwright.

Badenhausen Boiler Co., Jersey City, N. J., capital $25,000, to manufacture water - tube boilers. Inncorporators—John O. Badenhausen, Henry C. Badenhausen and David N. Plahn.

Minnesota Plumbing & Heating Supply Co., Minneapolis, Minn., capital $10,000. Among those interested is John A. Peters.

William A. Keen Plumbing & Heating Co., Baltimore, Md. Incorporators—William A. Keen, Leonard F. Fowler and H. Hampton Linthicum.

Universal Ventilating Co., Augusta, Me., to manufacture and sell patented ventilating apparatus. President, R. S. Buzzell, Augusta; treasurer, L. J. Coleman, Augusta.

Portland Central Heating Co., Portland, Ore. Incorporators—John H. Hall, L. H. Tarploy and W. O. Van Schuyver.

Horn-Lowden Co., New Haven, Conn., incorporated to conduct a heating and plumbing business. Incorporators—Vernon W. Lowden, Lewis N. Horn and Ernest A. Krooner, all of New Haven.

Business Chances.

Wichita, Kan.—A new heating plant will be installed in the city hall. J. A. Harts is Public Building Commissioner.

Stillwater, Min.—A new heating plant for the armory, jail, city hall and engine house is under discussion and tentative plans have been prepared by John D. Roberts of St. Paul and Robert L. Butler of Stillwater.

Washington, D. C.—Sealed bids will be received by the Supervising Architect, Treasury Department, for the following named work:

Until Oct. 14, 1912, for the construccomplete, including plumbino gas piping, heating apparatus, electric conduit and wiring and lighting fixtures of the United States Post Office at Johnstown, N. Y.

Until Oct. 14, 1912, for the construction, including plumbing, gas piping, heating apparatus, electric conduits and wiring, etc., of the United States Post Office at Oldtown, Me.

Contracts Awarded.

Johnson Heating Co., New York, heating and ventilating grammar school addition and the manual training school at Perth Amboy, N. J., for $8,850. A central heating plant will be installed. Another bid of $11,195 was received from Kelly & McAlinden. J. K. Jensen is the architect.

This is the Valve

Used in the

MORGAN-CLARK VACUUM HEATING and FLUSHING SYSTEM

Note the Automatic Self-Cleaning Movable By-Pass

Reduces fuel cost to the minimum. A Flushing System that operates from the engine room, thoroughly cleaning the valves when necessary.

Our 1911 Booklet A takes up Details of Construction and Operation. May we send it to you?

MORGAN-CLARK SYSTEM COMPANY 380 Exchange St. Rochester, N. Y.

Lewis & Kitchen, Chicago, heating and ventilating Normal High School building at Bloomington, Ill. the plumbing contract went to the Ross-Johnston Co., Bloomington.

M. J. Ramler & Son, Toledo, O., heating and ventilating high school at Marion, O., for $7,200. Warm air furnaces will be used.

Virginia Plumbing & Heating Co., Virginia, Minn., heating school building at Buhl for $2,028.

Timothy McEvoy & Son, Buffalo, N. Y., were low bidders, at $18,000, for the heating plant at the penitentiary in Buffalo. The bids were referred to the penitentiary committee by the supervisors.

Kramer & Webber, Canal Dover, O., heating and ventilating Second Street School.

R. R. Brenner, Kalamazoo, Mich., heating and ventilating Frank Street School at Kalamazoo for $2,047.

A. M. Pentz, Rochelle, Ill., heating and plumbing new Baxter & Hamlin Building at Rochelle.

Springfield, Ill.—Bids for a new heating and ventilating plant for the high school building at Springfield were received as follows: R. Hass, $21,000, allowing $500 for salvage; Lewis & Kitchen, Chicago, $20,966, allowing $500 for salvage; Riefler, Perkins & Co., $23,000, with $100 extra for the Johnson regulator system, allowing $400 for salvage; Illinois Plumbing & Heating Co., $22,480; Henry McVeigh, $23,250; Sodemann Heat & Power Co., St. Louis, $19,847; Carson Payson Co., $23,500.

Rochester, N. Y.—Bids were received as follows for heating Building No. 9 at Exposition Park, where the Public Library and Rochester Historical Society will shortly be located: Frank H. Falls, $4,924; R. T. Ford Co., $4,837.

Ferris & Sons, Sioux Falls, S. D., heating county jail for $4,375. Other bids were: Dow Bros., $4,275; Maxwell Hardware Co., $4,555; Canders & Smith, $3,350, without thermostats.

C. J. Burke, Kearney, Neb., steam heating and ventilating Alcott School at that place.

J. B. Collins, Houston, Tex., heating and plumbing two-story annex and basement of the Harvard School at Houston Heights for $2,595.

J. J. Powers Estate, Brockton, Mass., steam heating and ventilating Howard School for $7,991. Other bidders were; J. T. Corcoran, $8,825; and J. E. Holland Co., $8,448.

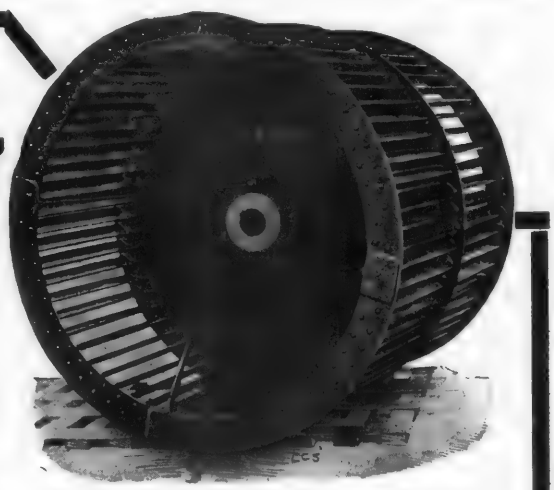
Stone & Underhill, Boston, heating and ventilating new high school building at Keene, N. H., for $6,900.

Luderbach Plumbing Co., Jackson, Miss., heating, lighting and plumbing

The Original Fan of the Many Blade Plan.

"Sirocco"
TRADE MARK.

Heating and Ventilating Fans



Enormous capacities for their small size.
Low installation cost.
Low power consumption.
Low maintenance charges.

The more you study fans the better you will like "Sirocco."

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AMERICAN BLOWER COMPANY
DETROIT, MICH.
U. S. A.

Canadian Sirocco Company, Limited, Windsor, Ontario.
Manufacturers for Canada.

new Peabody school building at Oxford, Miss.

Columbus Heating & Ventilating Co., Columbus, O., heating and ventilating new College Hill School at Tiffin, O., for $3,890. Other bidders were: V. M. Gattius, Toledo, $3,345; William T. Chafin, Toledo, $3,345; and the Peck-Hammond Co., Cincinnati, $3,750.

Edward L. Gnekow, Stockton, Cal., heating and ventilating Washington School for $2,220.

Grambs & Peet, Dickenson, N. D., heating, ventilating and plumbing Elk Home at Dickenson for $7,000.

Western Heating & Ventilating Co., Ogden, Utah, heating and ventilating new school building at Corinne, Utah.

F. P. Walsh, San Francisco, Cal., was low bidder, at $11,887, for the steam heating and ventilating work for the State Hospital at Stockton.

McGivray Construction Co., Sacramento, Cal., was the low bidder at $2,500, for the steam heating of the Sacramento Armory building. This firm was also the low bidder, at $4,600, for the plumbing and gas fitting of this building.

Thomas Heating Co., Racine, Wis., heating and ventilating new county court house for $10,943; the plumbing work went to the Charles Wilkenson Co., Minneapolis, at its bid of $5,476.

P. L. McQuillan, Chippewa Falls, Wis., installing new boilers for the central heating plant in the municipal building at Eau Claire, for $2,995.

Doran Bros., International Falls, Minn., heating and ventilating new high school building at that place for $20,000; the plumbing contract went to Adamson & Co., St. Paul, at their bid of $6,711.

Johnson & Davis, Denver, Col., heating and ventilating and plumbing of the Citizens' Bank building for $11,500.

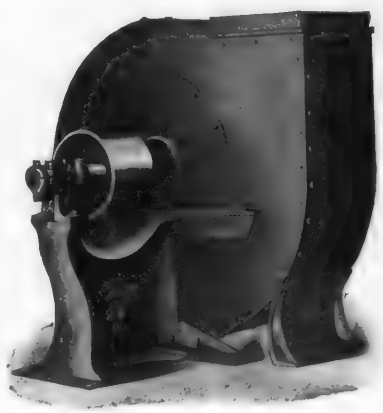
Carson-Payton Co., Champaign, Ill., heating and plumbing new St. John's Church, at that place.

Wyckoff-Lloyd Co., Springfield, Mass., heating and ventilating addition to the Main Street School, at West Springfield, for $5,300.

Ogden Plumbing & Heating Co., Ogden, Utah, heating and plumbing new Snowville School, near Ogden, $2,715.

Crookston Plumbing Co., Crookston, Minn., heating and plumbing new convent for the Sisters of St. Joseph, at Crookston, for $8,229.

Reis & Donovan, New York, steam heating new 17-story apartment house at 903 Park Ave., New York, said to be the tallest apartment building in the world. 14,000 sq. ft. of radiation will be installed. The building will be heated by the Broomel system of vapor heating. Consulting engineer, P. R. Moses,



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are only one detail in the construction o Sturtevant Fans, yet they insure long life, high efficiency, and low power consumption.

In numerous tests they have been proven the equal and in some cases superior to any roller or ball-bearing for fan practice.

The friction does not increase with use, for they operate with undiminished efficiency for years.

The bearings for every Sturtevant Fan are carefully made, lined by a special process with Sturtevant White Metal (the most expensive babbitt obtainable) and carefully reamed and scraped to fit.

The fan to meet your requirements is waiting to be shipped from stock.

Our engineering organization is ready to make suggestions if you will write fully about your requirements.

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HYDE PARK, MASS.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

New York. Owners, Bing & Bing, New York.

Howe Bros., Los Angeles, Cal., heating and plumbing concrete hotel building on Grand Ave., Los Angeles, for $29,821, for the Los Angeles Cemetery Association.

Robert Dalziel, Jr., Co., San Francisco, Cal., installing a power plant in the State Hospital at Patton, Cal., for $23,127.

Neil A. McLean, San Francisco, Cal., was the low bidder, at $12,000, for the steam heating and ventilating of the new State Armory at San Francisco. This firm was also the low bidder, at $11,000, for the plumbing, gas-fitting and vacuum cleaning systems for the same building.

Scranton, Pa.—Bids were received as follows for the installation of new heating, ventilating and plumbing systems in Public Schools Nos. 10, 14 and 15:

School No. 10.	
Diesing & Co	$ 2,120.00
P. F. & M. T. Howley	3,097.00
E. Roberts	3,787.00
School No. 14.	
Brown Bros.	$ 9,604.00
P. F. & M. T. Howley	9,775.00
Haggerty Bros.	10,203.00
T. J. O'Malley (plumbing only)	3,025.00
Wolf & Wenzel (plumbing only)	3,150.00
Gunster Bros.	10,123.00
Gaylord & Eitapenc	9,773.00
Wardell & Barrett (plumbing only)	3,400.00
Gaylord & Butler (heating and ventilating)	6,943.00
School No. 15.	
Gunster Bros.	$ 2,953.00
P. F. & M. T. Howley	2,593.00
E. Roberts	3,267.04
Wolf & Wenzel	2,424.00
Brown Bros.	2,419.45
W. F. Buckley	2,639.00

Providence, R. I.—Bids were received as follows for the heating and ventilation of the Science Building at the Rhode Island State College: Dennis McCarthy, Providence, $6,484; Dexter Engineering Co., Providence, $7,200; C. H. Sanborn, Boston, $7,209; Isaac Coffin Co., Boston, $7,773; William E. Doherty, Providence, $8,789.

Harvey Meyers, Upper Sandusky, O., heating and ventilating new high school at that place.

Wm. A. Reinhardt, Ashland, Wis., heating Masonic Building at Phillips, Ark.

Wernette & Bradfield, Grand Rapids, Mich., heating new seminary at Holland; also installing power plant at the Newaygo water works.

L. A. Brink, Greenfield, Ia., heating and plumbing new school building at Orient for $3,000.

Pacific Fire Extinguisher Co., San Francisco, Cal., heating and ventilating San Francisco Hospital for $5,376.

Robert Scott Engineering Co., Philadelphia, Pa., direct steam heating system for the Baldwin Locomotive Company's shops at Eddystone, Pa.

Everetts & Oberdear Co., Lancaster, Pa., heating State tuberculosis sanitarium at Cresson.

McPhail Bros., Fort Wayne, Ind., heating First Presbyterian Church, in that city.

Royal Steam Heater Co., Gardner, Mass., steam heating West Broadway School for $2,000.

Columbus Heating & Ventilating Co., Columbus, O., heating and ventilating new Thurston School at Thurston, O.

Trade Literature

Valve World for Aug., 1913, published by the Crane Co., Chicago, contains, among other things, an article on "History and Units of the Metric System," which is the first of a series on the subject. The hope is expressed editorially that the metric system may be here adopted eventually by the industrial and commercial interests of the United States. The name of Justin W. McEachern appears on the editorial page as editor of *Valve World*.

Positive Pressure Blowers are described in a catalogue just issued by Albert J. Kelting, 459 Carroll St., Brooklyn, N. Y. The catalogue starts off by giving a comparison of the different methods of moving air for high, low and intermediate pressures, and then contains a full description of the Kelting positive pressure blower. This blower is of unique design and operates at moderate speed; at the same time, no gears are necessary and it gives a steady non-pulsating blast, and as it has no unbalanced moving parts, runs quietly and without vibration. The absence of all valves and the fact that the blower occupies small floor space, are other points in its construction. This blower is also suitable for vacuum work.

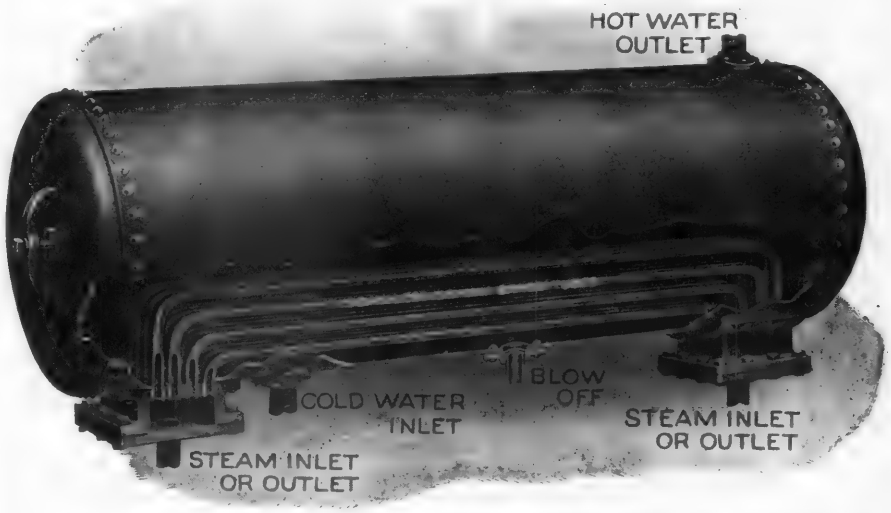
J-M Power Expert for August, 1912, published by the Cleveland branch of the H. W. Johns-Manville Co., contains an illustrated description of the Audiffren-Singrun refrigerating machine which is being marketed by the H. W. Johns-Manville Co. The machine, which is especially designed for use in residences, hotels, clubs, etc., operates on the compression system, using sulphur dioxide as the refrigerating plant. Sulphur dioxide can be condensed or liquified at low pressure; hence there is little likelihood of leaky connections. Moreover, this gas is not poisonous and is dangerous only if allowed to escape into a confined space where it might vitiate the air necessary for breathing.

The machine consists of two globes joined by a hollow shaft which carries on its extension a pulley or shaft; in

PATTERSON
HOT WATER TANK

the practical improvement upon the old style tank and coil.

Boiler Plate Shells, Heavy Seamless Drawn Brass Tubes. For use with exhaust or live steam, or low pressure boilers.



There is no idle heating surface in Patterson Plumbers' Tank Heaters. The steam enters the large expansion chamber, expands and uniformly fills the large number of "∩" shaped tubes of small diameter the area of which is much greater than of the steam inlet pipe. As fast as the steam condenses in transmitting its heat to the surrounding water, this condensation is discharged to the condensation chamber and flows by gravity back to the boiler.

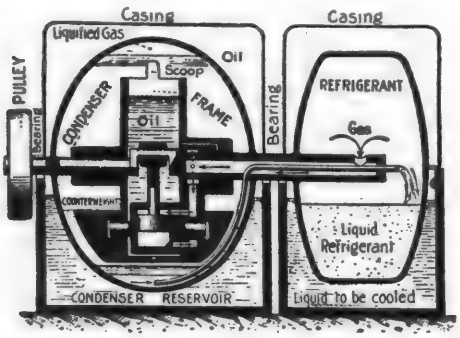
In the ordinary tank where a coil or return bend is used of the same area or size as the steam inlet pipe, its heating efficiency is rapidly destroyed, due to its being filled up by the water of condensation which forms more rapidly than it can be discharged through the single pipe.

Patterson Heaters never create back pressure. The tubes never leak. The heads never blow out.

FRANK PATTERSON & CO.

26 CORTLANDT STREET
NEW YORK

appearance, it resembles a dumb bell. There are no joints, valves, gauges or stuffing boxes. One need but place the machine in its bearings, fill the condenser and refrigerator tanks with water and apply the power to have, at will and within a very few minutes, an abundance of cold air, cooled water, ice, etc.



Audiffern - Singrun Refrigerating Machine. (Front view.)

One of the most novel features of the Audiffern-Singrun refrigerating machine is the fact that the compressor operates in the atmosphere which it compresses, within a hermetically sealed condenser. There are no connections that might leak; the pressure is not sufficiently high to cause an explosion even if the machine be run without condensing water or otherwise maltreated. Any form of motive power can be used—steam, gas, gasoline, electricity, etc.

Heating Efficiency That Speaks for Itself is a circular descriptive of the "largest single pipe (without air line) low pressure steam heating apparatus in the world, containing over 70,000 sq. ft. of radiating surface and 12 miles of steam pipes." The system was designed and installed by the Raisler Heating Co., New York, in the Riviera Building, at 156th to 157th Street and Riverside Drive, New York. Additional figures for this building are that 1,200 American Peerless radiators are installed while the boiler equipment consists of 600 H. P. Star water tube boilers.

We Could Not Trademark the Red Color of Rainbow, says a circular issued by the Peerless Rubber Co., New York, but we are protecting our friends by placing on every piece of genuine Rainbow the following trademark (consisting of the word Rainbow enclosed in a diamond-shaped border). The circular adds that the company also manufactures a complete line of high-grade of mechanical rubber goods, including belting, packing and hose of every description.

Green's Economizer, devoted to recent developments in steam plant practice as affecting boiler efficiency and the economical recovery of heat from gases of combustion, is the subject of a new catalogue published by the Green Fuel Economizer Co., Matteawan, N. Y., which is not only a handsome and exhaustive publication but contains data that stamp it as one of the important engineering contributions of the year on this subject. Charts have been prepared, for instance, showing the flue gas temperatures corresponding to different rates of driving boiler heating surface, the temperature relations existing in a boiler and economizer installation, and how part of the boiler surface, as ordinarily installed, may advantageously be replaced by economizer surface. Tests are plotted showing the temperature of the feed water and flue gases in and out of the economizer during a period of two months, of an electric light plant in Springfield, Ill. Still another chart shows the lowest temperatures to which it pays to cool gases by means of boiler surface, together with a corresponding chart for economizer surface. The earnings from economizer surface for each 100 degrees difference between the initial tmperature of the gases and the initial temperature of the water for different numbers of square feet of economizer surface per boiler horsepower developed are shown on another chart, based upon actual results developed in over 150 boiler tests. This chart affords a means of foretelling the earnings to be expected from an economizer under given conditions. Accompanying all of these charts is explanatory text matter, with various examples worked out to illustrate the application of economizers to plants of different kinds, together with many photographs and drawings showing typical installations. Size, 6x9 ins. (standard). Pp. 104.

Foxboro Improved Recording Gauges, listing nearly 300 ranges in three sizes, covering all purposes and pressures from full vacuum to 10,000 lbs. per square inch, are the subject of a new bulletin published by the Industrial Instrument Co., Foxboro, Mass. The lists are arranged to facilitate quick and easy selection of instruments and each instrument is assigned a code word for convenience in identification. The bulletin is No. 65. Size, 8x11 ins. Pp. 24 (punched for binding).

Some Points of Superiority of the Lagonda Water Strainer, a new publication issued by the Lagonda Mfg. Co., Springfield, O., gives considerable practical information on the installation and operation of water strainers for power plant purposes. It also points out how a Lagonda type of strainer saves floor space in an engine room, as large pits are not necessary, it being possible to bury the whole strainer under the floor with only the top and hand wheel exposed.

BOOKS ON HEATING AND VENTILATION

Mechanical Equipment of Federal Buildings Under Control of the Treasury Department. By Nelson S. Thompson, chief mechanical and electrical engineer, office of the supervising architect. Second edition, revised and enlarged. Contains the basic data used in the design of the mechanical and electrical equipment of Federal buildings under the control of the Treasury Department. Also contains data for approximating the cost of the various parts of the work. The book takes in heating and ventilation, plumbing, stationary and portable vacuum cleaning plants, engines and generators, motors and controlling apparatus, forced systems of hot water heating, commercial practice in factory heating, etc., and other valuable data. Cloth, $2.00.

Central Station Heating. By Byron T. Gifford. This work presents the most advanced practice in central station heating, both steam and hot water, and is an invaluable guide, not only to the engineer, but to municipalities and public service commissions where district heating is being, or will be, used. 208 pages, with 42 figures, including 50 pages of miscellaneous engineering data. Size 6 x 9¾ in., bound in flexible leather. Price, $4.00.

Mechanics of Heating and Ventilating. By Konrad Meier. Including a series of ten charts containing data relating to the flow of water, steam and air, collected by Mr. Meier during an experience of 26 years in heating and ventilating work, both in this country and abroad. Each of the charts replaces a series of tables on the subject, giving at a glance the result of a calculation from any combination of factors. 161 pages, illustrated, with ten large charts. Size 6 x 9 in. Price, $5.00. Separate sets of charts, printed on cloth, with lines in different colors and mounted on boards. Single charts, $1.50. Sets of ten charts, $15.00.

Heating and Ventilating Buildings, a standard manual for heating engineers and architects. By Prof. R. C. Carpenter. Fifth edition, largely rewritten. 577 pages, 277 illustrations, 8vo, cloth, $4.00.

Handbook for Heating and Ventilating Engineers. By Prof. James D. Hoffman and Benjamin F. Raber. The latest book on this subject. Unusually comprehensive. 320 pages, with 45-page appendix. Size 4½x6¾ in., bound in flexible leather. Price, $3.50.

Questions and Answers on the Practice and Theory of Steam and Hot-Water Heating. By R. M. Starbuck. Illustrated. $1.00.

Ventilation of Buildings. By William G. Snow and Thomas Nolan. 83 pages. Pocket size. Contains a statement of the general principles of ventilation and of their application to different kinds of buildings. Boards, 50c.

Steam Heating and Ventilation. By Wm. S. Monroe. Containing formulas and data valuable in the designing of heating and ventilating plants. Price, $2.00.

Steam-Electric Power Plants. By Frank Koester. A practical treatise on the design of Central Light and Power Stations and their economical construction and operation. 473 pages. 340 ills. Price, $5.00.

Steam Power Plants; Their Design and Construction. By Henry C. Meyer, Fr., M. E. Third edition, fully revised. One of the standard works on the design and construction of power plants. Covers proportioning boilers, selection and writing specifications for steam engines, selection and arrangement of auxiliaries, construction of chimneys, coal handling, etc. 219 pages. Size 6 x 9 in. Illustrated and with folding plates. Price $2.00 postpaid.

Steam Power Plant Piping Systems. By W. L. Morris, M. E. A complete treatise on design, installation and maintenance, covering the details of all phases of piping and giving much space to the subject of maintenance. Expert advice given on problems arising from mistakes and breakdowns in the piping. 490 pages. Size 6 x 9 in. 389 ills. Price $5.00 postpaid.

Practical Steam and Hot Water Heating. By Alfred G. King. Containing over 300 detailed illustrations. The book is a working manual for heating contractors, journeymen steam fitters, architects and builders. Describes various systems of heating and ventilation and includes useful data and tables for estimating, installing and testing such systems. 8vo. 367 pages. Price, $3.00.

Power, Heating and Ventilation. By Charles L. Hubbard, B.S., M.E. **A treatise for designing and constructing engineers and architects. The whole subject of heating is covered, including the heating of large institutions with central plants. Space is also devoted to electrical matters connected with steam plants. 647 pages. Price, $5.00 (three volumes in one).**

Notes on Heating and Ventilation. By John R. Allen. 152 Pages. 34 illustrations. Size, 4½x6¾ in. One of the new books, brought quite up to date, and containing much information to guide the intelligent steam fitter in the installation and heating and ventilating apparatus. Cloth, $2.50.

Steam Fitters' Computation and Price Book, abridged. By Mark Dean. Price, $2.50.

The School House. Its Heating and Ventilation. By J. A. Moore. 204 pages, illustrated. $2.00.

A Manual of Heating and Ventilation, for engineers and architects, embracing tables and formulas for dimensions of pipes for steam and hot-water boilers, flues, etc. By F. Schumann. Second edition, revised and enlarged. 12mo, $1.50.

German Formulas and Tables for Heating and Ventilating Work, especially adapted for those who plan or erect heating apparatus. By Prof. J. H. Kinealy. Illustrated. Price, $1.00.

Centrifugal Fans. By J. H. Kinealy. A theoretical and practical treatise on fans for moving air in large quantities at comparatively low pressures. 206 pages. 39 diagrams. Full limp leather pocketbook round corners, gilt edges. Price, $5.00.

The Principles of Heating. By William G. Snow. A practical and comprehensive treatise on Applied Theory in Heating. 161 pages. 42 illustrations. 38 tables. Size, 6x9 in. Cloth, $2.00.

Modern Sanitary Plumbing, Steam and Hot Water. By James J. Lawler. 400 pages. 228 illustrations. Size, 6x9 in. This is the latest edition of Mr. Lawler's well-known work on this subject. Price, $4.00

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The HEATING and VENTILATING MAGAZINE 1123 Broadway NEW YORK

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

A Typical Large Installation of Chamberlin Metal Weather Strip, published by the Chamberlin Metal Weather Strip Co., Detroit, Mich., describes the equipment of sixteen principal buildings of the University of Michigan, at Ann Arbor, Mich., with this type of weather stripping. The circular goes on to state that as a result of the installation it was found possible, in connection with two of the buildings that were inadequately heated, to give up a plan that had almost been adopted of providing auxiliary heat from outside sources.

This is the House That Professor Jones, of Yale, Built is a clever circular issued by the Vapor-Vacuum Heating Co., Philadelphia, Pa., showing the heating layout for this residence, together with a view of the house itself, as equipped with the Kriebel system of vapor-vacuum heating. Included in the circular is a letter from the owner expressing his satisfaction with the system after a year's trial.

How to Buy a Vacuum Cleaner is the title of an interesting treatise written by Carl D. Bushnell, M. E., and published by the United States Radiator Corporation, Detroit, Mich. The author discusses the "two essential elements," which, he says, are suction and volume; also the two general classes of vacuum cleaners—high and low vacuum. Comparisons are made between the piston pump types, bellows types, and fan and cycloidal pump types. The author then takes up the Capitol-Connersville vacuum system, a comparatively high vacuum system, and the Capitol-Invincible, equipped with a low vacuum fan. The fan design of the Capitol-Invincible is especially interesting. The fans are connected in series, i. e., the air is drawn into the center of the first fan, passed into a set of stationary conversion vanes, thence into the second revolving fan, and by this fan is passed into the second set of conversion vanes, from which it escapes and exhausts through the port in the exhaust chamber. This operation has reference to a two-fan machine. The purpose of this design is to enable the conversion blades or vanes to convert the velocity energy of the air into pressure. The booklet includes views of each type of cleaner. Size, 4x7. Pp. 16.

Portable or Hand Tachometers, single spindle multi-speed spring type, for hand application to engine or machine shafts, pulleys or fly wheels, designed by Dr. Thorn, Leipzig, Germany, are featured in the March, 1912, bulletin of the Industrial Instrument Co., Foxboro, Mass. The company's line of stationary tachometers and tachographs are also described, with illustrations, in this bulletin, which is of the company's standard size, 8 x 11 in., punched for binding. Pp. 8.

Wanted.

Wanted—Experienced estimator on large heating, ventilating and power work. New York City position. State salary, references and experience. Address Z., care of HEATING AND VENTILATING MAGAZINE.

Wanted—Young man with some knowledge of drafting to learn the heating engineering business. Address Number 10, care of HEATING AND VENTILATING MAGAZINE.

Wanted—Heating and ventilating engineer for out of town. State experience and salary expected. Address Number 20, care of HEATING AND VENTILATING MAGAZINE.

Engineer with wide experience in designing and installing heating and ventilating plants for hospitals, office buildings, factories, etc., desires to locate with a progressive firm in small city or large town. Can make money for the right party. Address Experience, care of HEATING AND VENTILATING MAGAZINE.

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A Cycloidal Fan or Blower

for all purposes. The only radical improvement in fans in forty years. Takes up less room, runs at slower speed, requires less power, noiseless in operation.

We guarantee our Cycloidals to equal in capacity any fan built—We bar none—with from 20 to 25 per cent. less speed and power. We build them in all sizes to suit all conditions—hundreds of them in use—not "as good—but better."

GARDEN CITY FAN CO.

Patentees and Sole Manufacturers

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BY

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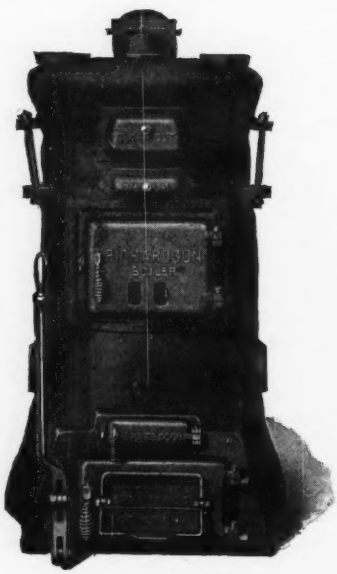

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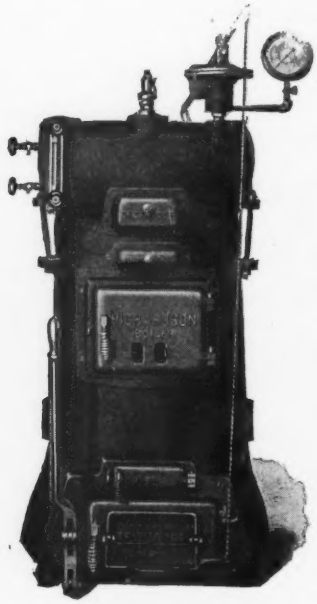

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